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SARDINE EGGS AND LARVAE AND OTHER FISH LARVAE, PACIFIC COAST, 1956

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EXPLANATORY NOTE

The series embodies results of investigations, usually of restricted scope, intended to aid or direct management or utilization practices and as guides for administrative or legislative action. It is issued in limited quantities for official use of Federal, State or cooperating agencies and in processed form for economy and to avoid delay in publication.

United States Department of the Interior, Fred A. Seaton, Secretary
Fish and Wildlife Service, Arnie J. Suomela, Commissioner

SARDINE EGGS AND LARVAE AND OTHER FISH LARVAE PACIFIC COAST, 1956

by

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ABSTRACT

This report is the seventh in a continuing yearly series. It contains the results of quantitative sampling of fish eggs and larvae off the coasts of California and Baja California during 1956. The eggs and larvae were obtained in plankton hauls taken on biological-oceanographic cruises by agencies participating in the California Cooperative Oceanic Fisheries Investigations.

All occurrences of eggs of the Pacific sardine (Sardinops caerulea) are reported by age (in days); larvae of the sardine are reported by size. The larvae of three other species are reported by size: northern anchovy (Engraulis mordax), jack mackerel (Trachurus symmetricus), and Pacific mackerel (Pneumatophorus diego). The larvae of two fishes are reported by number per station only: hake (Merluccius productus) and rockfish (Sebastodes spp.). The report includes charts showing the distribution and relative abundance in 1956 of each of the above species, except rockfish, and brief descriptive accounts of each.

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SARDINE EGGS AND LARVAE AND OTHER FISH LARVAE, PACIFIC COAST, 1956

The present report is the seventh in a continuing yearly series. It contains the basic data on quantitative sampling of fish eggs and larvae off the coasts of California and Baja California during 1956. The species reported upon are the following: Pacific sardine (Sardinops caerulea), northern anchovy (Engraulis mordax), jack mackerel (Trachurus symmetricus), Pacific mackerel (Pneumatophorus diego), hake (Merluccius productus), and rockfish (Sebastodes spp.). The preceding reports in the series are listed in the bibliography.

The material was obtained on biological-oceanographic survey cruises made as part of a cooperative program conducted under the California Cooperative Oceanic Fisheries Investigations. These investigations are sponsored by the California Marine Research Committee and are carried out cooperatively by the South Pacific Fishery Investigations of the U. S. Fish and Wildlife Service, by Scripps Institution of Oceanography of the University of California, the Hopkins Marine Station of Stanford University, the California Department of Fish and Game, and the California Academy of Sciences.

As in previous reports, the data are presented in eight tables:

I. Record of standardized haul factors for oblique hauls made with plankton nets during cruises 5601-5612, 1956
II. Record of sardine eggs, reported by age in days
III. Record of all hauls containing sardine larvae, reported by size (in millimeters)
IV. Record of all hauls containing anchovy larvae, reported by size (in millimeters)
V. Record of all hauls containing jack mackerel larvae, reported by size (in millimeters)
VI. Record of all hauls containing Pacific mackerel larvae, reported by size (in millimeters)
VII. Hake larvae, reported by number per station
VIII. Rockfish larvae, reported by number per station.

The above tables of basic data are designated by Roman numerals. A number of text tables are also included in this report; these are designated by Arabic numerals. Following the precedent set in the preceding report, charts are included which give the distribution and abundance in 1956 of each of the above categories, except rockfish. Each section is preceded by a brief descriptive account.

It is with deep pleasure that we acknowledge the cooperation given by the Scripps Institution of Oceanography in the collection of data at sea. Most of the personnel of the South Pacific Fishery Investigations contributed to this project, many devoting their full time to it. David Kramer and Lois Hunter aided in the identifications, enumerations and measurements; James Thrailkill supervised the separation of fish eggs and larvae from plankton collections, and also prepared the charts included in this report.

Figure 1.--Station plan, 1956, of the California Cooperative Oceanic Fisheries Investigations

AREA COVERED

The area covered on survey cruises made during 1956 is shown in figure 1. The north-south extent of the coverage was from Cape Mendocino, off northern California (station line 40), to below Cape San Lucas, Baja California (station line 157); the offshore coverage extended 250 miles seaward or more on some lines. The survey area was not completely covered on any one cruise. The number of stations occupied during each monthly cruise is summarized in text table 1, by sub-areas. The most intensive coverage was obtained during April through July (178 to 239 stations per cruise). The sub-area off northern California (lines 40-57) was occupied during May and June only, that off central California (lines 60-77) between April and July, and the sub-area off southern Baja California (lines 140-157) on three cruises between January and April. No sub-area was covered on every cruise. The sub-area off southern California (lines 80-93) had the most repeated coverage (10 cruises), while the sub-areas off central Baja California (lines 110-137) were covered continuously between January and September.

There were three cruises into the Gulf of California in 1956, made in February, April and December. Data from the Gulf cruises will be reported in a separate publication.

One to four vessels participated on each cruise. The "Black Douglas" made eight survey cruises (February through September). The following vessels operated by the Scripps Institution of Oceanography participated in the cruises indicated: "Stranger": 5 cruises (January through May), "Horizon": 2 cruises (January, December), "S. F. Baird": 4 cruises (February, April-June), "Paolina T.": 2 cruises (June, July), "Orca": 4 cruises (July, October-December).

METHODS OF SAMPLING

The plankton nets used during 1956 were either constructed of No. 30xxx silk grit gauze or nylon bolting cloth of fairly similar mesh size (Refer to Ahlstrom and Kramer 1957:4 for more detail). Plankton hauls are made obliquely from approximately 140 meters deep to the surface (200 meters of wire out at greatest depth), at all localities where depth of water permits. The hauls are made at a vessel speed of between one and two knots. During a haul, an inclinometer is suspended from the boom, riding freely on the towing wire. The angle of stray of the towing wire from the vertical is recorded at intervals, and the inclinometer readings also are closely watched in order to maintain favorable vessel speeds during the period of hauling. The depth of the net at any instant during a haul can be approximated by multiplying the amount of tow wire out by the cosine of the angle of stray of the towing wire from the vertical. The amount of water strained during each haul is determined from the revolutions registered during the haul by a current meter fastened in the mouth of the net. For more details concerning sampling procedures refer to previous reports in this series.

Text table 1.--Coverage during 1956

Month	Cruise number	Number vessels participating	Area covered	Number of stations occupied in each subarea							Total stations
				Lines 40-57	Lines 60-77	Lines 80-93	Lines 97-107	Lines 110-120	Lines 123-137	Lines 140-157	
January	5601	2	80-157	-	-	26	21	29	16	18	110
February	5602	3	80-157	-	-	28	23	30	18	31	130
March	5603	2	80-137	-	-	37	32	38	27	-	134
April	5604	3	60-157	-	27	39	32	33	20	27	178
May	5605	3	40-137	27	26	56	59	47	24	-	239
June	5606	3	40-137	27	25	49	36	47	25	-	209
July	5607	3	60-137	-	34	55	50	40	22	-	201
August	5608	1	110-137	-	-	-	-	22	14	-	36
September	5609	1	110-137	-	-	-	-	22	14	-	36
October	5610	1	80-97	-	-	35	7	-	-	-	42
November	5611	1	80-97	-	-	33	7	-	-	-	40
December	5612	2	80-97	-	-	35	7	-	-	-	42
Total			40-157	54	112	393	274	308	180	76	1397

ABUNDANCE OF FISH LARVAE IN 1956

In the preceding report in this series, a text table was included which summarized the monthly abundance (standard haul totals) of fish larvae collected in 1955 (Ahlstrom and Kramer 1957, text table 5, p. 36). A similar table is included in this report as text table 2. The species covered in this report, i.e., sardine, anchovy, jack mackerel, Pacific mackerel, hake, and rockfish, made up 68.36% of the larvae collected in 1956, and 72.09% of the larvae collected in 1955. The remaining 28 to 32% consisted mostly of larvae of pelagic fishes that have little or no commercial importance, but considerable importance as forage species, and to a lesser extent of commercial species that were present in moderate abundance only. In our enumerations, the "other fish larvae" were placed in no fewer than 110 categories, some of which represented individual species, others were generic or even family groupings. The five most common "other" larvae, four of which represent individual species, were the following:

	Standard number of larvae	Percent of total
Citharichthys spp.	23,635	5.79
Leuroglossus stilbius	18,620	4.56
Lampanyctus leucopsarus	15,125	3.71
Lampanyctus mexicanus	10,802	2.65
Vinciguerria lucetia	9,832	2.41
	78,014	19.12

Four species of Citharichthys are included under Citharichthys spp.: C. fragilis, C. sordidus, C. stigmaeus, and C. xanthostigma. Of these, only C. sordidus is fished commercially and it is the least common of the four species in our collections. Among the other flatfish larvae taken in 1956, arranged in order of abundance, were Symphurus atricaudus, Pleuronichthys spp. (mostly P. verticalis), Lyopsetta exilis, Parophrys vetulus, Paralichthys californicus, Microstomus pacificus, Glyptocephalus zachirus, Hippoglossina stomata, and Bothus constellatus.

The species included in this report keep the same rank as in 1955, with anchovy larvae most abundant and the other species as shown below:

	1956		1955	
	Number	Percent	Number	Percent
Anchovy	134,931	33.06	140,183	39.03
Hake	89,857	22.02	60,090	16.73
Rockfish	29,144	7.14	29,341	8.17
Sardine	15,523	3.80	14,121	3.93
Jack mackerel	8,027	1.97	13,246	3.69
Pacific mackerel	1,519	0.37	1,950	0.54

Text table 2.--Abundance (standard haul totals) of fish larvae in 1956, summarized by month

	Sardine	Anchovy	Jack mackerel	Pacific mackerel	Hake	Rockfish	All other fish larvae	Total
January	1,129	8,844	0	11	33,376	4,293	10,598	58,251
February	2,948	29,139	533	0	39,746	7,717	14,194	94,277
March	999	16,640	2,860	4	15,010	6,404	10,715	52,632
April	779	22,857	302	41	1,047	2,887	11,816	39,729
May	778	11,938	949	408	301	2,286	16,067	32,727
June	1,922	18,260	2,186	105	195	1,584	11,469	35,721
July	1,512	14,720	1,149	334	90	1,489	21,194	40,488
August	4,415	9,635	48	605	47	397	21,568	36,715
September	1,035	373	0	11	0	0	9,167	10,586
October	6	825	0	0	6	317	941	2,095
November	0	1,423	0	0	0	358	616	2,397
December	0	277	0	0	39	1,412	794	2,522
Total	15,523	134,931	8,027	1,519	89,857	29,144	129,139	408,140
Percent	3.80	33.06	1.97	0.37	22.02	7.14	31.64	100.00

RECORD OF STANDARDIZED HAUL FACTORS FOR OBLIQUE HAULS MADE WITH PLANKTON NETS DURING CRUISES 5601-5612, 1956

Standardized haul factors are given for all plankton hauls taken on survey cruises during 1956, except those made in the Gulf of California (table I). Additional information concerning each haul, including position of occupancy, date and time of collection, volume of water strained, and depth of haul in meters is given in Thrailkill, 1957 (Zooplankton volumes off the Pacific coast, 1956).

A standardized haul factor is used for adjusting counts of eggs and larvae from a station to the number under 10 square meters of sea surface. This estimate is a valid one, if the vertical distributions of the eggs or larvae have been encompassed. As noted in the preceding report (Ahlstrom and Kramer 1957:4), this requirement has been met for all species included in this report except hake larvae. It is estimated that about 10% of hake larvae occur below 140 meters, the average depth sampled in taking routine plankton hauls.

The following symbols are used in table I:

(-) - a dash indicates that the station was not occupied on the cruise under which it appears
NQ - plankton haul taken, but not considered quantitative
NS - station occupied, but sample subsequently spoiled, broken or lost.

Six stations were occupied by two different vessels on cruise 5603, and two stations were occupied twice on cruise 5606. The standard haul factors for the second occupancy of the above eight stations are listed here, since there is no space for these factors in table I.

Cruise	Station	S. Factor	Cruise	Station	S. Factor
5603	100.90	3.07	5603	103.80	3.28
5603	103.50	2.94	5603	103.90	2.98
5603	103.60	3.75	5606	90.75	3.01
5603	103.70	2.99	5606	90.80	2.73

The standard haul factors for stations occupied in the Gulf of California or on station lines below the Gulf (several lines of stations were occupied to the south of the Gulf on cruise 5612) are not included in this report.

Table I

Record of Standardized Haul Factors for Oblique Hauls made with Plankton Nets during Cruises 5601-5612, 1956

	Cruise and Month											
Sta.	5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
40.38	-	-	-	-	3.04	1.51	-	-	-	-	-	-
.40	-	-	-	-	3.00	2.66	-	-	-	-	-	-
.45	-	-	-	-	2.33	2.54	-	-	-	-	-	-
.50	-	-	-	-	2.81	1.98	-	-	-	-	-	-
.60	-	-	-	-	2.97	2.97	-	-	-	-	-	-
.70	-	-	-	-	2.30	5.29	-	-	-	-	-	-
.80	-	-	-	-	2.94	3.56	-	-	-	-	-	-
.90	-	-	-	-	2.74	3.43	-	-	-	-	-	-
43.42	-	-	-	-	3.53	2.91	-	-	-	-	-	-
.50	-	-	-	-	2.29	2.84	-	-	-	-	-	-
.60	-	-	-	-	3.49	2.72	-	-	-	-	-	-
47.50	-	-	-	-	4.06	3.33	-	-	-	-	-	-
.55	-	-	-	-	1.86	2.90	-	-	-	-	-	-
.60	-	-	-	-	3.26	2.56	-	-	-	-	-	-
50.47	-	-	-	-	2.84	1.66	-	-	-	-	-	-
.50	-	-	-	-	2.90	3.60	-	-	-	-	-	-
.55	-	-	-	-	3.10	2.94	-	-	-	-	-	-
.60	-	-	-	-	3.90	2.20	-	-	-	-	-	-
.70	-	-	-	-	2.07	3.00	-	-	-	-	-	-
.80	-	-	-	-	3.24	3.08	-	-	-	-	-	-
.90	-	-	-	-	3.35	2.65	-	-	-	-	-	-
53.52	-	-	-	-	3.94	3.29	-	-	-	-	-	-
.55	-	-	-	-	3.11	2.51	-	-	-	-	-	-
.65	-	-	-	-	2.76	2.72	-	-	-	-	-	-
57.51	-	-	-	-	3.24	2.47	-	-	-	-	-	-
.55	-	-	-	-	2.80	2.79	-	-	-	-	-	-
.65	-	-	-	-	3.12	3.32	-	-	-	-	-	-
60.50	-	-	-	3.37	-	-	-	-	-	-	-	-
.55	-	-	-	3.37	3.27	3.60	3.70	-	-	-	-	-
.57	-	-	-	3.07	-	2.56	-	-	-	-	-	-
.60	-	-	-	3.34	2.87	1.86	2.71	-	-	-	-	-
.70	-	-	-	2.97	2.60	2.89	2.52	-	-	-	-	-
.80	-	-	-	1.74	2.52	2.37	2.61	-	-	-	-	-
.90	-	-	-	3.40	3.89	3.40	2.94	-	-	-	-	-
63.52	-	-	-	2.38	1.88	1.99	3.18	-	-	-	-	-
.55	-	-	-	2.84	2.57	2.12	4.63	-	-	-	-	-
.60	-	-	-	-	-	-	2.92	-	-	-	-	-
.65	-	-	-	3.19	3.41	2.29	-	-	-	-	-	-
.70	-	-	-	-	-	-	2.70	-	-	-	-	-
.80	-	-	-	3.13	-	-	3.33	-	-	-	-	-
.90	-	-	-	-	-	-	2.94	-	-	-	-	-
67.50	-	-	-	3.16	3.10	3.08	2.29	-	-	-	-	-
.55	-	-	-	2.78	3.18	2.74	5.40	-	-	-	-	-

Table I (Cont'd)
Record of Standardized Haul Factors for Oblique Hauls made with Plankton Nets during Cruises 5601-5612, 1956

Sta.	Cruise and Month 5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
67.60	-	-	-	-	-	-	3.43	-	-	-	-	-
.65	-	-	-	3.61	1.67	2.19	-	-	-	-	-	-
.70	-	-	-	-	-	-	3.31	-	-	-	-	-
.80	-	-	-	3.36	-	-	3.11	-	-	-	-	-
.90	-	-	-	-	-	-	3.11	-	-	-	-	-
70.52	-	-	-	3.06	2.11	2.33	2.23	-	-	-	-	-
.55	-	-	-	2.37	2.67	2.44	2.96	-	-	-	-	-
.60	-	-	-	2.71	3.46	3.15	3.14	-	-	-	-	-
.70	-	-	-	3.90	4.53	1.25	2.59	-	-	-	-	-
.80	-	-	-	3.40	2.59	2.59	2.68	-	-	-	-	-
.90	-	-	-	3.20	3.18	2.12	3.12	-	-	-	-	-
73.50	-	-	-	3.28	2.62	2.85	2.61	-	-	-	-	-
.60	-	-	-	3.45	2.61	3.08	2.98	-	-	-	-	-
.70	-	-	-	3.27	2.02	2.63	3.73	-	-	-	-	-
.80	-	-	-	-	3.64	-	3.55	-	-	-	-	-
.90	-	-	-	-	-	-	3.42	-	-	-	-	-
77.50	-	-	-	3.18	2.52	2.54	3.04	-	-	-	-	-
.55	-	-	-	2.39	2.91	4.17	2.81	-	-	-	-	-
.60	-	-	-	-	2.65	3.19	3.08	-	-	-	-	-
.65	-	-	-	3.06	-	-	-	-	-	-	-	-
.70	-	-	-	-	4.46	2.98	3.05	-	-	-	-	-
.80	-	-	-	-	2.99	-	3.38	-	-	-	-	-
.90	-	-	-	-	-	-	3.44	-	-	-	-	-
80.51	1.70	1.62	NS	2.36	2.10	2.39	2.53	-	-	2.54	3.07	2.73
.55	1.99	2.30	1.54	3.23	2.61	2.33	3.00	-	-	2.94	3.08	2.97
.60	3.37	3.16	2.69	4.12	3.12	1.96	2.59	-	-	2.92	2.85	3.07
.70	2.80	3.06	3.18	3.38	2.68	2.17	2.91	-	-	2.92	3.24	3.22
.80	2.70	2.96	2.41	3.73	3.20	2.35	2.91	-	-	3.01	3.13	3.07
.90	2.11	3.07	2.99	3.64	2.87	2.66	2.94	-	-	2.98	2.93	3.05
82.47	-	2.15	1.48	3.06	2.47	2.49	2.34	-	-	2.87	3.08	2.93
83.40	1.84	NQ	0.83	0.77	1.39	NQ	1.38	-	-	2.03	2.23	-
.43	2.09	2.97	2.78	2.87	3.60	NQ	2.54	-	-	2.84	3.04	3.14
.48	-	-	-	-	-	-	2.61	-	-	-	-	-
.51	2.29	1.34	2.67	2.87	2.91	2.76	2.93	-	-	2.86	3.32	3.16
.55	-	-	-	3.28	2.81	2.92	2.74	-	-	2.77	2.98	3.02
.60	3.27	2.59	2.98	3.39	3.16	2.42	2.83	-	-	2.97	2.89	3.07
.70	-	-	2.72	4.04	2.41	2.84	3.17	-	-	-	-	-
.80	-	-	3.09	3.27	2.73	2.35	2.77	-	-	-	-	-
.90	-	-	2.61	3.06	3.19	2.87	3.04	-	-	-	-	-
87.36	1.82	3.36	2.47	3.29	2.53	1.99	2.61	-	-	-	2.71	3.09
.40	2.38	3.15	3.19	3.58	3.62	2.44	3.06	-	-	2.99	3.23	3.02
.45	-	-	-	-	3.03	2.69	4.08	-	-	3.04	2.84	3.05
.50	2.10	2.89	2.24	2.61	2.03	2.95	3.86	-	-	2.88	2.72	2.66

Table I (Cont'd)
Record of Standardized Haul Factors for Oblique Hauls made with Plankton Nets during Cruises 5601-5612, 1956

	Cruise and Month											
Sta.	5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
87.55	-	-	-	-	3.39	2.70	2.26	-	-	3.40	3.23	3.17
.60	2.49	2.89	2.56	3.82	2.40	2.87	3.97	-	-	3.39	2.99	3.21
.65	-	-	-	-	2.70	2.67	3.19	-	-	-	-	-
.70	-	-	2.77	3.53	2.42	2.76	3.05	-	-	-	-	-
.75	-	-	-	-	2.05	-	3.04	-	-	-	-	-
.80	-	-	2.99	3.61	3.08	2.78	2.94	-	-	-	-	-
.85	-	-	-	-	-	-	2.96	-	-	-	-	-
.90	-	-	2.93	2.93	2.75	-	2.84	-	-	-	-	-
90.28	2.16	2.73	2.66	1.94	2.08	1.27	2.80	-	-	3.20	2.89	2.12
.30	1.49	2.82	3.13	2.93	3.15	2.40	2.93	-	-	2.81	2.41	2.85
.37	3.22	3.39	2.84	3.30	2.67	2.85	3.15	-	-	3.10	2.38	2.78
.45	3.12	2.73	3.24	2.75	4.16	4.67	3.39	-	-	3.05	2.82	2.90
.50	-	-	-	-	2.28	2.94	3.02	-	-	3.04	3.30	2.82
.55	2.98	3.28	3.05	4.33	3.61	2.25	2.61	-	-	2.90	1.96	2.94
.60	2.00	3.08	3.97	3.97	3.14	2.47	2.97	-	-	3.00	2.25	2.69
.65	-	-	-	-	2.38	2.70	2.91	-	-	-	-	-
.70	3.51	3.08	3.00	3.54	3.07	2.76	3.11	-	-	3.45	-	2.90
.75	-	-	-	-	3.20	3.20	3.04	-	-	-	-	-
.80	2.46	4.13	3.14	3.12	2.38	3.47	3.07	-	-	3.03	-	2.82
.85	-	-	-	-	1.98	1.31	3.14	-	-	-	-	-
.90	-	-	2.74	3.60	3.21	2.97	2.88	-	-	2.97	-	3.28
.95	-	-	-	-	3.19	-	-	-	-	-	-	-
.100	-	-	-	-	2.27	-	-	-	-	-	-	-
93.27	2.58	2.35	2.89	3.05	2.80	2.32	2.35	-	-	3.25	1.80	2.74
.30	2.93	1.75	4.10	2.99	3.01	3.32	2.34	-	-	3.23	2.84	2.93
.35	-	-	-	-	3.10	2.43	2.23	-	-	3.04	2.82	2.73
.40	2.39	2.75	2.74	3.72	1.89	2.76	2.66	-	-	3.06	2.87	2.92
.45	-	-	-	-	2.83	2.94	2.73	-	-	3.25	2.94	2.98
.50	1.69	2.71	4.23	3.95	3.54	2.85	3.31	-	-	3.07	2.69	2.92
.55	-	-	-	-	2.32	1.92	2.59	-	-	3.45	2.85	2.83
.60	-	2.99	2.91	3.05	3.43	2.86	2.09	-	-	3.09	2.86	2.98
.65	-	-	-	-	-	4.27	1.71	-	-	-	-	-
.70	-	3.32	2.78	3.38	2.80	2.45	3.40	-	-	-	-	-
.75	-	-	-	-	3.38	2.34	2.56	-	-	-	-	-
.80	-	-	2.35	2.87	3.11	3.12	2.82	-	-	-	-	-
.85	-	-	-	-	2.98	1.73	2.79	-	-	-	-	-
.90	-	-	2.89	4.64	3.30	2.03	3.15	-	-	-	-	-
.95	-	-	-	-	3.23	-	-	-	-	-	-	-
.100	-	-	-	-	1.99	-	-	-	-	-	-	-
97.30	1.77	2.18	2.17	2.94	2.38	4.99	2.39	-	-	2.90	2.50	2.13
.32	3.02	2.72	2.98	2.91	3.47	2.51	2.94	-	-	3.23	2.89	2.86
.40	3.03	3.05	5.08	3.61	3.40	2.04	2.41	-	-	3.30	2.74	2.96
.45	-	-	-	-	3.83	NS	2.91	-	-	3.03	3.08	2.84

Table I (Cont'd)

Record of Standardized Haul Factors for Oblique Hauls made with Plankton Nets during Cruises 5601-5612, 1956

	Cruise and Month											
Sta.	5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
97.50	3.12	2.87	2.95	3.60	3.82	3.02	2.65	-	-	3.12	2.80	3.10
.55	-	-	-	-	3.85	2.44	2.85	-	-	3.15	2.84	3.20
.60	-	3.37	2.92	2.83	3.21	2.05	2.44	-	-	3.09	2.92	2.95
.65	-	-	-	-	2.63	1.25	2.36	-	-	-	-	-
.70	-	2.87	3.06	3.92	3.09	1.72	2.07	-	-	-	-	-
.75	-	-	-	-	3.14	2.10	2.14	-	-	-	-	-
.80	-	-	2.84	4.20	3.03	1.76	3.17	-	-	-	-	-
.85	-	-	-	-	2.87	1.16	3.08	-	-	-	-	-
.90	-	-	2.66	3.19	3.13	1.59	2.93	-	-	-	-	-
.95	-	-	-	-	3.18	-	-	-	-	-	-	-
.100	-	-	-	-	3.62	-	-	-	-	-	-	-
100.29	2.48	2.91	2.99	3.40	2.79	1.91	2.34	-	-	-	-	-
.30	1.60	-	-	-	3.24	-	2.15	-	-	-	-	-
.33	-	3.67	3.04	3.24	-	2.42	-	-	-	-	-	-
.35	-	-	-	-	3.07	2.71	2.78	-	-	-	-	-
.40	2.18	2.53	3.02	3.37	2.74	2.62	2.66	-	-	-	-	-
.45	-	-	-	-	3.02	2.16	2.35	-	-	-	-	-
.50	3.55	3.35	3.02	3.33	2.36	2.70	2.21	-	-	-	-	-
.55	-	-	-	-	2.88	-	2.79	-	-	-	-	-
.60	3.25	2.74	3.30	3.45	3.03	2.85	2.13	-	-	-	-	-
.65	-	-	-	-	3.07	2.34	2.37	-	-	-	-	-
.70	1.47	3.44	2.80	2.60	3.00	-	3.22	-	-	-	-	-
.75	-	-	-	-	3.04	-	2.15	-	-	-	-	-
.80	3.19	3.06	2.97	3.72	2.29	-	2.26	-	-	-	-	-
.85	-	-	-	-	3.25	-	2.11	-	-	-	-	-
.90	-	-	3.00	3.19	2.65	-	2.79	-	-	-	-	-
.95	-	-	-	-	3.98	-	-	-	-	-	-	-
.100	-	-	-	-	2.23	-	-	-	-	-	-	-
103.30	3.04	2.90	3.73	2.20	5.80	2.47	1.12	-	-	-	-	-
.35	2.90	3.18	2.89	3.43	4.76	2.82	2.88	-	-	-	-	-
.40	3.32	2.85	3.08	3.34	3.00	2.64	2.31	-	-	-	-	-
.45	-	-	-	-	2.92	-	2.64	-	-	-	-	-
.50	2.91	3.01	3.21	3.16	3.13	-	2.81	-	-	-	-	-
.55	-	-	-	-	3.15	-	3.34	-	-	-	-	-
.60	3.48	2.83	3.75	3.42	3.06	-	2.43	-	-	-	-	-
.65	-	-	-	-	2.71	-	2.19	-	-	-	-	-
.70	-	-	3.40	2.95	2.99	-	2.46	-	-	-	-	-
.75	-	-	-	-	2.77	-	2.93	-	-	-	-	-
.80	-	-	3.87	3.27	3.12	-	2.86	-	-	-	-	-
.85	-	-	-	-	2.56	-	2.21	-	-	-	-	-
.90	-	-	3.49	3.16	2.88	-	2.41	-	-	-	-	-
.95	-	-	-	-	2.43	-	-	-	-	-	-	-
.100	-	-	-	-	3.01	-	-	-	-	-	-	-

Table I (Cont'd)
Record of Standardized Haul Factors for Oblique Hauls made with Plankton Nets during Cruises 5601-5612, 1956

Sta.	Cruise and Month											
	5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
107.32	2.87	3.01	3.30	2.52	4.70	3.65	1.91	-	-	-	-	-
.35	2.60	3.52	4.20	2.58	4.87	2.83	2.36	-	-	-	-	-
.40	2.10	3.01	3.45	3.30	4.68	3.34	2.59	-	-	-	-	-
.45	-	-	-	-	5.83	3.00	2.46	-	-	-	-	-
.50	3.23	3.19	3.30	2.24	5.47	3.30	2.57	-	-	-	-	-
.55	-	-	-	-	6.02	3.69	2.24	-	-	-	-	-
.60	3.20	3.54	3.23	2.44	6.86	3.33	2.05	-	-	-	-	-
.65	-	-	-	-	5.28	3.67	-	-	-	-	-	-
.70	-	-	3.54	2.59	5.47	3.06	1.73	-	-	-	-	-
.75	-	-	-	-	5.70	3.10	-	-	-	-	-	-
.80	-	-	3.03	2.27	5.35	3.20	2.66	-	-	-	-	-
.85	-	-	-	-	5.88	3.16	-	-	-	-	-	-
.90	-	-	3.28	3.04	4.89	3.17	2.51	-	-	-	-	-
110.33	2.28	2.43	2.86	3.27	5.95	3.20	4.37	2.72	2.62	-	-	-
.35	2.96	2.72	2.82	2.98	4.99	3.01	4.32	2.49	2.70	-	-	-
.40	2.75	3.23	3.26	2.78	5.00	3.39	2.26	2.15	3.06	-	-	-
.45	-	-	-	-	4.99	3.72	3.07	-	-	-	-	-
.50	3.26	2.94	2.85	2.59	4.74	3.16	2.07	-	-	-	-	-
.55	-	-	-	-	6.19	3.98	2.53	-	-	-	-	-
.60	2.57	2.84	2.79	2.61	5.70	3.05	2.35	-	-	-	-	-
.65	-	-	-	-	7.12	3.36	-	-	-	-	-	-
.70	3.48	3.12	2.86	2.05	5.28	3.13	2.37	-	-	-	-	-
.75	-	-	-	-	6.05	3.50	-	-	-	-	-	-
.80	3.46	3.19	3.04	2.41	5.36	3.20	2.15	-	-	-	-	-
.85	-	-	-	-	4.68	3.43	-	-	-	-	-	-
.90	-	-	2.57	2.11	4.95	2.93	1.98	-	-	-	-	-
113.30	NS	2.05	2.16	3.22	4.63	1.75	2.15	2.95	2.44	-	-	-
.35	3.64	2.78	2.91	2.86	5.32	3.15	4.51	3.18	3.13	-	-	-
.40	2.96	2.87	3.52	2.43	5.60	3.18	4.80	3.13	2.53	-	-	-
.45	-	-	3.22	-	4.99	4.55	4.03	-	-	-	-	-
.50	2.75	3.05	3.00	1.85	4.93	3.94	3.77	-	-	-	-	-
.55	-	-	4.38	-	4.60	3.50	3.24	-	-	-	-	-
.60	2.80	2.74	4.02	2.71	5.27	3.59	3.13	-	-	-	-	-
.65	-	-	-	-	5.75	3.50	-	-	-	-	-	-
.70	2.50	2.93	3.66	2.85	2.52	3.17	3.60	-	-	-	-	-
.75	-	-	-	-	5.49	3.34	-	-	-	-	-	-
.80	-	-	3.64	2.18	4.00	3.36	3.65	-	-	-	-	-
115.27	-	-	-	-	-	-	-	3.97	4.06	-	-	-
.30	-	-	-	-	-	-	-	3.59	3.94	-	-	-
.35	-	-	-	-	-	-	-	3.79	2.80	-	-	-
.40	-	-	-	-	-	-	-	3.52	2.78	-	-	-
117.26	2.88	2.27	2.75	1.90	4.01	5.05	3.44	3.71	1.72	-	-	-
.30	2.75	3.10	2.94	1.25	4.42	5.08	4.06	3.90	2.92	-	-	-

Table I (Cont'd)

Record of Standardized Haul Factors for Oblique Hauls made with Plankton Nets during Cruises 5601-5612, 1956

	Cruise and Month											
Sta.	5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
117.35	2.61	2.88	2.66	2.59	2.82	4.67	3.31	2.84	2.52	-	-	-
.40	2.63	2.41	2.52	2.66	3.09	3.32	3.46	3.02	3.33	-	-	-
.45	-	-	3.20	-	3.56	3.20	3.36	-	-	-	-	-
.50	3.24	3.19	2.95	2.24	3.55	3.34	3.43	-	-	-	-	-
.55	-	-	3.39	-	4.12	3.32	3.56	-	-	-	-	-
.60	3.19	2.45	3.49	2.27	4.30	3.43	3.29	-	-	-	-	-
.65	-	-	-	-	4.66	3.37	-	-	-	-	-	-
.70	3.07	3.75	3.27	3.58	4.11	3.22	3.42	-	-	-	-	-
.75	-	-	-	-	3.82	3.52	-	-	-	-	-	-
.80	-	-	3.46	3.02	3.96	3.20	3.14	-	-	-	-	-
118.25	-	-	-	-	-	-	-	2.36	2.91	-	-	-
.30	-	-	-	-	-	-	-	3.15	3.49	-	-	-
.35	-	-	-	-	-	-	-	3.34	3.45	-	-	-
.39	2.44	2.80	2.62	NQ	5.13	3.38	3.31	-	-	-	-	-
119.33	3.05	2.52	2.58	2.51	4.36	5.48	3.39	-	-	-	-	-
120.25	3.21	2.47	2.82	2.74	3.12	5.46	2.83	2.64	3.67	-	-	-
.30	2.79	2.84	3.19	3.75	3.56	6.05	2.98	3.61	3.50	-	-	-
.35	-	-	-	-	-	-	-	3.12	4.08	-	-	-
.40	1.07	2.33	2.34	2.30	1.69	2.09	2.13	2.24	1.94	-	-	-
.45	3.30	3.04	3.90	3.38	3.58	3.54	3.07	3.40	3.00	-	-	-
.50	3.15	3.11	3.40	3.08	3.02	3.73	3.14	-	-	-	-	-
.55	3.11	2.66	3.01	2.14	2.99	3.27	2.84	-	-	-	-	-
.60	3.66	4.43	3.62	3.64	3.51	3.38	3.06	-	-	-	-	-
.70	3.20	2.06	2.88	2.60	2.91	3.59	3.12	-	-	-	-	-
.80	-	-	3.41	2.79	2.69	3.08	2.36	-	-	-	-	-
123.37	2.22	2.41	2.90	1.85	2.52	3.02	2.83	2.84	2.77	-	-	-
.40	2.83	-	3.26	2.38	-	3.63	-	-	-	-	-	-
.42	-	3.42	-	2.13	2.45	4.09	3.18	2.93	3.27	-	-	-
.45	-	-	3.14	-	-	-	-	3.04	3.64	-	-	-
.50	NS	2.72	3.06	2.56	3.06	3.72	2.58	-	-	-	-	-
.55	2.71	NS	3.36	-	3.29	3.33	2.82	-	-	-	-	-
.60	-	-	3.71	2.56	3.41	3.08	3.13	-	-	-	-	-
127.34	2.81	2.80	2.65	3.77	2.76	3.31	NS	2.34	2.82	-	-	-
.40	2.54	2.62	3.25	3.03	3.02	3.67	3.33	3.21	3.07	-	-	-
.45	-	-	3.04	-	3.22	3.81	3.06	3.35	3.60	-	-	-
.50	3.17	2.82	3.65	2.75	3.09	3.99	4.51	-	-	-	-	-
.55	2.96	2.61	2.81	-	3.00	3.95	2.21	-	-	-	-	-
.60	-	-	2.83	3.34	2.87	3.79	3.03	-	-	-	-	-
130.30	2.61	1.47	2.50	3.61	3.03	3.08	2.16	3.56	2.16	-	-	-
.35	3.17	2.51	3.01	2.86	3.12	3.57	2.52	3.58	3.31	-	-	-
.40	2.70	2.47	3.08	2.86	2.99	3.60	2.89	3.06	3.43	-	-	-
.45	-	-	NQ	-	-	-	-	3.47	3.12	-	-	-
.50	2.16	2.67	2.85	2.80	2.92	3.63	3.14	-	-	-	-	-

Table I (Cont'd)
Record of Standardized Haul Factors for Oblique Hauls made with Plankton Nets during Cruises 5601-5612, 1956

	Cruise and Month											
Sta.	5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
130.60	-	3.37	3.24	2.81	3.07	3.42	2.67	-	-	-	-	-
133.25	2.24	3.11	3.33	2.85	4.76	3.57	2.29	3.78	3.84	-	-	-
.30	2.88	2.85	2.52	3.30	4.10	2.99	2.50	3.03	3.98	-	-	-
.40	3.73	2.71	2.79	2.90	4.25	1.91	3.14	-	-	-	-	-
.50	-	-	2.75	-	3.34	3.42	2.96	-	-	-	-	-
.60	-	-	3.26	-	-	-	-	-	-	-	-	-
137.23	2.49	1.47	2.39	2.44	2.67	2.93	2.86	2.63	2.68	-	-	-
.30	2.16	3.28	3.10	2.91	3.29	2.55	2.55	3.68	5.35	-	-	-
.40	2.48	3.39	3.07	3.18	3.17	4.50	3.21	-	-	-	-	-
.50	-	-	3.43	-	3.34	3.43	2.93	-	-	-	-	-
.60	-	-	2.63	-	-	-	-	-	-	-	-	-
140.30	1.78	3.21	-	2.87	-	-	-	-	-	-	-	-
.35	3.11	3.58	-	2.23	-	-	-	-	-	-	-	-
.40	2.32	2.98	-	2.70	-	-	-	-	-	-	-	-
.50	-	2.21	-	-	-	-	-	-	-	-	-	-
.60	-	2.83	-	-	-	-	-	-	-	-	-	-
143.26	1.36	1.89	-	2.76	-	-	-	-	-	-	-	-
.30	2.98	3.12	-	2.51	-	-	-	-	-	-	-	-
.35	2.55	2.55	-	2.39	-	-	-	-	-	-	-	-
.40	-	2.23	-	2.22	-	-	-	-	-	-	-	-
.50	-	2.91	-	-	-	-	-	-	-	-	-	-
.60	-	3.43	-	-	-	-	-	-	-	-	-	-
147.20	3.15	3.34	-	3.16	-	-	-	-	-	-	-	-
.25	3.65	2.54	-	2.39	-	-	-	-	-	-	-	-
.30	2.57	2.81	-	2.73	-	-	-	-	-	-	-	-
.35	-	2.22	-	2.66	-	-	-	-	-	-	-	-
.40	-	1.98	-	1.93	-	-	-	-	-	-	-	-
150.19	2.45	2.95	-	2.60	-	-	-	-	-	-	-	-
.25	3.07	3.16	-	2.62	-	-	-	-	-	-	-	-
.30	3.01	4.69	-	2.09	-	-	-	-	-	-	-	-
.40	-	2.28	-	3.43	-	-	-	-	-	-	-	-
153.16	2.38	2.13	-	2.69	-	-	-	-	-	-	-	-
.20	2.69	3.00	-	2.54	-	-	-	-	-	-	-	-
.30	2.67	3.46	-	3.09	-	-	-	-	-	-	-	-
.40	-	2.04	-	3.04	-	-	-	-	-	-	-	-
.50	-	2.88	-	2.13	-	-	-	-	-	-	-	-
.60	-	1.99	-	2.94	-	-	-	-	-	-	-	-
157.10	2.06	-	-	-	-	-	-	-	-	-	-	-
.20	2.55	2.50	-	3.10	-	-	-	-	-	-	-	-
.30	2.44	2.83	-	2.42	-	-	-	-	-	-	-	-
.40	-	1.98	-	2.49	-	-	-	-	-	-	-	-
.50	-	2.91	-	3.07	-	-	-	-	-	-	-	-
.60	-	4.49	-	2.97	-	-	-	-	-	-	-	-

RECORD OF SARDINE EGGS, 1956

A record of all hauls containing sardine eggs in 1956 is given in table II. As in previous reports, the eggs are divided into two categories, normal and abnormal. The number of normal eggs taken at each station is reported by age in days (A to D; see below). "Total number of eggs" includes abnormal as well as normal eggs, and also deteriorating eggs that cannot be classified with certainty. Abnormal eggs have embryos that are stunted and misshapen, either due to mechanical injury during collection (rupture of the vitelline membrane) or to a diseased condition of the eggs.

The eggs are separated into age categories, as follows:

A - Eggs spawned within 24 hours of collection
B - Eggs spawned within 24.1 to 48 hours of collection
C - Eggs spawned within 48.1 to 72 hours of collection
D - Eggs spawned within 72.1 to 96 hours of collection
Unclassified eggs (Uncl.) includes deteriorating eggs that cannot be classified with certainty.

A dash (-) in table II indicates that the category (D day eggs, usually) was not represented, actually or potentially. Rate of development of sardine eggs is related to the temperature at which development takes place. Sardine eggs take approximately 4.0 days to develop from spawning to hatching at 12.6°C, 3.0 days at 14.8°C, 2.0 days at 17.9°C, etc. Samples collected at temperatures between 12.6-14.8°C may contain sardine eggs from either 3 or 4 days' spawning, depending upon the time of collection. Similarly, samples collected at temperatures between 14.8-17.9°C may contain eggs from either 2 or 3 days' spawning, and samples collected at temperatures above 17.9°C may contain eggs from either 1 or 2 days' spawning. Sardines are seldom taken at temperatures high enough to permit embryonic development to be completed in less than one day.

The distribution and relative abundance of sardine eggs in 1956 are illustrated in figure 2. Five categories of abundance are used: 0 - zero spawning (station occupancy indicated only); light spawning, 1-30 eggs; moderate spawning, 31-300 eggs; moderately heavy spawning, 301-3000 eggs; and heavy spawning, over 3,000 eggs. The value shown for each station is the cumulative standard haul total for the year.

Occurrences and abundance (standard haul totals) of sardine eggs are summarized by month and area in text table 3. No sardine eggs were obtained off central or northern California (lines 40-77) in the 166 plankton hauls taken in this area between April and July. Sardine eggs were taken in two of the 76 hauls made off southern Baja California. The number of positive hauls was highest off northern Baja California (lines 97-107), where 19.3% of the hauls taken during the year contained sardine eggs. The percent of positive hauls taken in other areas was as follows: southern California (lines 80-93) - 7.1%, upper central Baja California (lines 110-120) - 15.2%, and lower central Baja California (lines 123-137) - 7.2%.

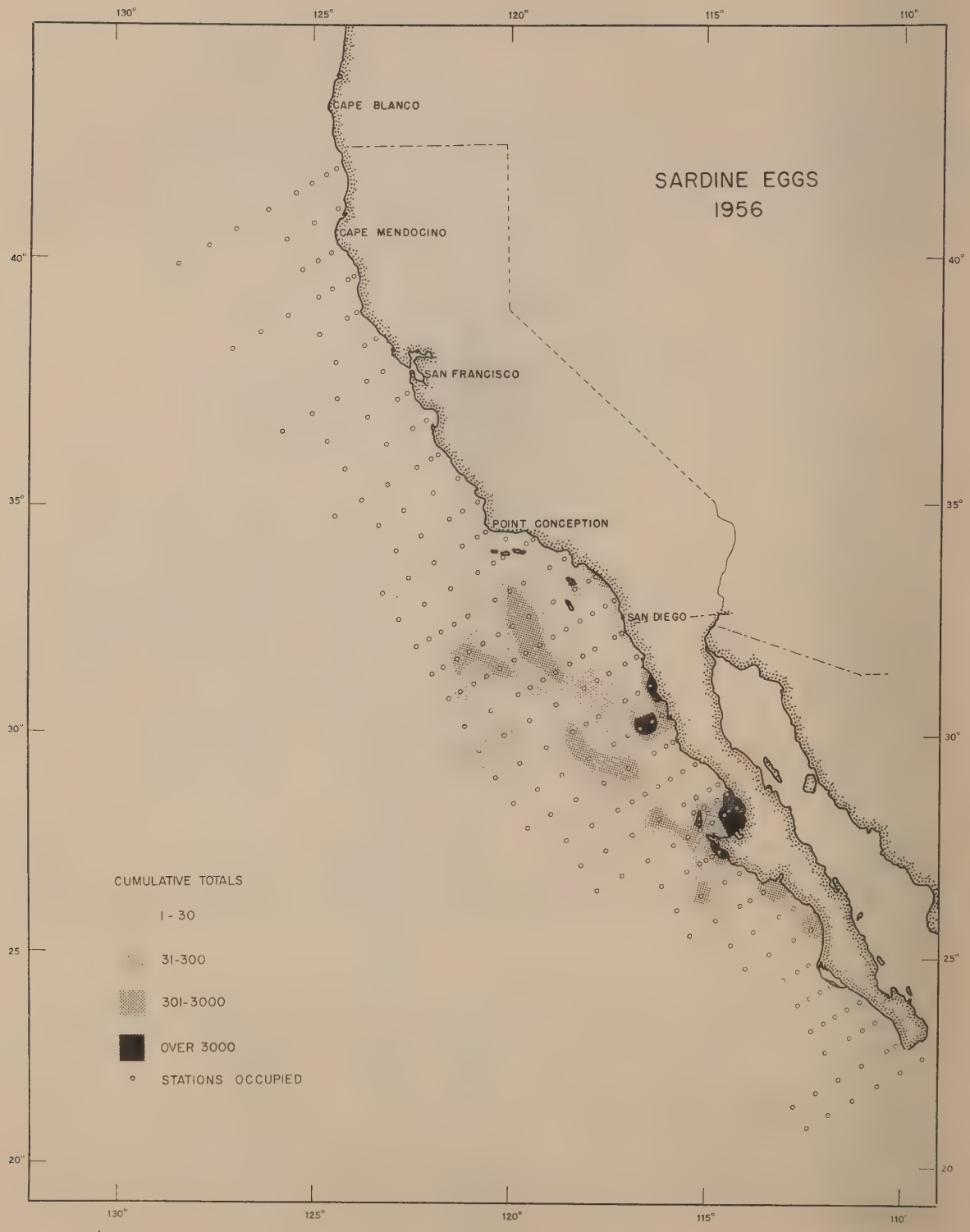

Figure 2.--Sardine eggs, 1956: Distribution and relative abundance

Text table 3.--Sardine eggs: Occurrence and abundance (standard haul totals) by month and area, in hauls made during 1956

Cruise	Northern and central California 40-77		Southern California 80-93		Northern Baja California 97-107		Upper central Baja California 110-120		Lower central Baja California 123-137		Southern Baja California 140-157		Total	
	occurrences	number	occurrences	number	occurrences	number	occurrences	number	occurrences	number	occurrences	number	occurrences	number
5601	-	-	0	0	0	0	2	969	0	0	1	23	3	992
5602	-	-	0	0	1	6	9	1,425	4	3,726	1	21	15	5,178
5603	-	-	3	14	19	1,992	13	2,909	3	1,476	-	-	38	6,391
5604	0	0	1	4	11	990	4	408	3	3,146	0	0	19	4,548
5605	0	0	14	7,716	12	1,269	4	6,111	0	0	-	-	30	15,096
5606	0	0	8	3,511	7	26,865	4	69	2	2,101	-	-	21	32,546
5607	0	0	2	417	3	2,921	3	13,345	0	0	-	-	8	16,683
5608	-	-	-	-	-	-	6	15,521	1	83	-	-	7	15,604
5609	-	-	-	-	-	-	2	1,212	0	0	-	-	2	1,212
5610	-	-	1	77	0	0	-	-	-	-	-	-	1	77
5611	-	-	0	0	0	0	-	-	-	-	-	-	0	0
5612	-	-	0	0	0	0	-	-	-	-	-	-	0	0
Total	0	0	29	11,739	53	34,043	47	41,969	13	10,532	2	44	144	98,327
Percent		0		11.94		34.62		42.69		10.71		0.04		100.00

Table II
Record of Sardine Eggs, 1956

Station	Number of normal eggs A	B	C	D	Total number of eggs A	B	C	D	Uncl.	n
Cruise 5601:										
118.39	0	0	2	-	0	0	2	-	0	2
120.40	38	506	29	-	57	816	78	-	16	967
143.26	11	7	-	-	12	11	-	-	0	23
Total	49	513	31	-	69	827	80	-	16	992
Cruise 5602:										
103.40	0	0	0	3	0	0	0	6	0	6
110.33	0	0	0	2	0	0	0	7	0	7
113.40	0	0	0	3	0	0	0	3	0	3
113.70	0	0	20	0	0	0	20	0	0	20
117.50	0	329	281	-	6	508	507	-	45	1066
117.60	0	0	0	-	0	0	3	-	0	3
117.70	0	0	4	-	0	0	4	-	0	4
120.25	10	5	0	-	10	5	0	-	0	15
120.40	0	149	9	37	0	224	9	56	0	289
120.45	0	12	6	-	0	12	6	-	0	18
123.37	328	443	733	-	1388	588	1389	-	0	3365
123.42	0	0	7	-	0	0	7	-	0	7
127.34	0	6	8	-	0	6	8	-	0	14
130.30	0	40	273	-	0	42	298	-	0	340
147.20	7	7	-	-	7	14	-	-	0	21
Total	345	991	1341	45	1411	1399	2251	72	45	5178
Cruise 5603:										
90.80	0	0	6	0	0	0	9	0	0	9
93.70	0	3	0	-	0	3	0	-	0	3
93.80	0	0	2	-	0	0	2	-	0	2
97.70	0	0	3	0	0	0	3	0	0	3
97.80	0	6	0	0	0	20	0	3	0	23
97.90	0	3	5	13	0	3	5	13	0	21
100.29	0	0	0	6	0	0	0	12	0	12
100.33	0	0	0	6	0	0	0	9	0	9
100.50	0	0	3	-	0	0	3	-	0	3
B100.90	6	0	0	-	6	0	0	-	0	6
S100.90	0	0	0	-	0	6	0	-	0	6
103.30	30	433	0	0	30	672	0	0	0	702
103.35	0	0	0	0	0	12	0	0	0	12
103.40	6	6	0	-	6	18	25	-	12	61

Table II (cont'd)
Record of Sardine Eggs, 1956

Station	Number of normal eggs A	B	C	D	Total number of eggs A	B	C	D	Uncl.	n
Cruise 5603 (cont'd):										
S103.50	0	0	13	-	0	0	13	-	0	13
S103.60	90	0	30	-	120	0	30	-	0	150
B103.70	3	0	6	-	12	0	6	-	0	18
B103.90	0	3	0	-	0	3	0	-	0	3
107.35	126	193	0	-	134	218	0	-	0	352
107.40	0	41	14	-	0	41	14	-	0	55
107.50	0	7	106	-	0	10	188	-	0	198
107.60	6	61	220	-	9	84	252	-	0	345
110.33	0	0	31	-	0	0	34	-	3	37
110.35	0	0	8	-	0	0	11	-	0	11
110.40	3	0	0	-	3	0	3	-	0	6
110.50	0	0	11	11	0	0	11	34	0	45
110.60	0	67	128	28	0	84	150	28	0	262
110.70	0	6	0	-	0	6	0	-	0	6
110.80	0	0	0	-	0	3	0	-	0	3
113.45	0	0	3	-	0	0	3	-	0	3
113.50	0	24	3	-	0	33	3	-	0	36
113.55	0	13	0	0	0	13	0	0	4	17
113.60	16	0	0	-	28	0	0	-	0	28
120.40	0	37	140	52	0	65	308	71	14	458
120.45	0	971	507	-	0	1271	706	-	20	1997
123.37	0	267	304	12	0	415	365	24	35	839
123.40	0	13	114	310	0	29	127	388	0	544
123.45	0	6	56	-	0	6	87	-	0	93
Total	286	2160	1713	438	348	3015	2358	582	88	6391
Cruise 5604:										
83.70	0	0	0	4	0	0	0	4	0	4
97.30	0	0	29	-	0	0	29	-	0	29
100.50	47	10	0	-	54	10	0	-	0	64
100.60	0	3	0	-	0	6	0	-	0	6
100.80	0	4	89	-	0	4	96	-	0	100
100.90	0	115	0	-	0	217	0	-	0	217
103.30	0	4	2	0	4	4	2	0	4	14
103.35	0	7	0	-	0	7	0	-	0	7
103.40	0	0	0	-	0	3	0	-	0	3
103.50	0	3	13	-	0	3	29	-	0	32
103.60	0	390	0	0	0	479	0	0	14	493
107.50	7	0	4	-	7	2	16	-	0	25
110.50	31	228	52	-	42	269	72	-	0	383
113.50	0	0	7	-	0	0	14	-	0	14

Table II (cont'd)
Record of Sardine Eggs, 1956

Station	Number of normal eggs A	B	C	D	Total number of eggs A	B	C	D	Uncl.	n
Cruise 5604 (cont'd):										
117.35	0	0	5	-	0	0	5	-	0	5
120.40	0	2	2	0	0	4	2	0	0	6
123.37	0	118	22	0	0	185	59	0	30	274
127.40	0	0	0	0	0	0	0	0	12	12
127.50	0	1111	0	-	0	2860	0	-	0	2860
Total	85	1995	225	4	107	4053	324	4	60	4548
Cruise 5605:										
87.55	14	0	0	-	14	0	0	-	0	14
87.70	0	0	0	-	0	5	0	-	0	5
90.37	0	48	0	-	0	80	0	-	0	80
90.55	736	1242	14	-	1198	1401	14	-	0	2613
90.60	132	0	6	-	289	6	6	-	0	301
90.70	12	25	6	-	18	37	6	-	12	73
90.75	512	602	90	-	691	781	103	-	90	1665
90.80	0	171	390	-	0	209	523	-	0	732
93.45	0	6	0	-	0	6	0	-	0	6
93.55	51	9	390	0	51	9	483	0	0	543
93.60	288	14	82	-	357	14	137	-	27	535
93.70	22	90	426	-	56	168	560	-	0	784
93.75	20	88	0	-	27	196	7	-	0	230
93.85	0	30	45	-	0	42	93	-	0	135
97.45	0	0	4	-	0	0	12	-	0	12
97.55	0	65	142	-	0	65	758	-	92	915
97.60	0	0	0	-	0	0	26	-	0	26
97.65	0	0	0	-	0	0	42	-	0	42
100.40	0	0	0	-	0	16	0	-	0	16
100.45	0	109	0	-	0	175	0	-	0	175
103.30	35	0	0	0	35	0	0	0	0	35
103.50	0	0	0	-	0	6	0	-	0	6
103.55	0	0	3	-	0	0	3	-	0	3
103.80	6	0	0	-	6	0	0	-	0	6
107.32	28	0	0	0	28	0	0	0	0	28
110.35	0	0	0	0	0	0	0	5	0	5
117.35	0	0	23	-	0	0	68	-	0	68
118.39	20	226	82	-	40	267	144	-	0	451
119.33	0	349	610	0	0	611	767	0	0	1378
120.30	242	1296	28	-	2506	1680	28	-	0	4214
Total	2118	4370	2341	0	5316	5774	3780	5	221	15096

Table II (cont'd)
Record of Sardine Eggs, 1956

Station	Number of normal eggs A	B	C	D	Total number of eggs A	B	C	D	Uncl.	n
Cruise 5606:										
87.55	0	410	551	194	0	723	1296	799	65	2883
87.60	6	0	0	0	23	0	0	0	0	23
90.28	0	2	5	-	0	4	8	-	0	12
90.55	9	99	45	-	18	117	45	-	0	180
93.27	0	0	2	-	2	0	2	-	0	4
93.55	0	8	0	-	0	27	0	-	0	27
93.60	0	69	0	-	6	223	17	-	0	246
93.65	0	68	0	-	0	136	0	-	0	136
97.50	0	0	3	-	0	0	3	-	0	3
97.60	0	2	0	-	0	4	41	-	0	45
103.30	3992	0	0	0	12232	0	0	0	0	12232
107.32	0	0	7	-	0	4	11	-	0	15
107.35	0	2128	0	0	0	5400	0	0	0	5400
107.40	0	5184	26	441	0	7963	53	1149	0	9165
107.45	0	6	0	-	0	6	0	-	0	6
120.25	11	0	0	-	11	0	0	-	0	11
120.30	0	12	0	-	0	12	0	-	0	12
120.40	0	0	42	-	0	0	42	-	0	42
120.45	0	0	4	0	0	0	4	0	0	4
137.30	362	153	92	-	1484	235	230	-	148	2097
137.40	0	4	0	-	0	4	0	-	0	4
Total	4380	8145	777	635	13776	14858	1752	1948	213	32547
Cruise 5607:										
87.36	0	0	3	-	0	0	3	-	0	3
90.28	314	11	22	-	381	11	22	-	0	414
97.30	0	0	0	0	0	0	0	10	0	10
103.30	273	112	0	0	331	143	0	0	0	474
107.32	206	848	741	-	237	1115	1085	-	0	2437
117.26	0	7	-	-	0	7	-	-	0	7
120.25	1404	1540	45	-	1993	1812	45	-	0	3850
120.30	9488	0	-	-	9488	0	-	-	0	9488
Total	11685	2518	811	0	12430	3088	1155	10	0	16683

Table II (cont'd)
Record of Sardine Eggs, 1956

Station	Number of normal eggs A	B	C	D	Total number of eggs A	B	C	D	Uncl.	n
Cruise 5608:										
118.25	0	5966	-	-	0	6570	-	-	227	6797
118.30	0	9	-	-	0	315	-	-	0	315
118.35	0	374	-	-	0	695	-	-	0	695
120.25	2165	3538	32	-	4055	3549	43	-	0	7647
120.35	0	6	-	-	0	6	-	-	0	6
120.40	0	36	-	-	0	61	-	-	0	61
133.25	64	-	-	-	75	-	-	-	8	83
Total	2229	9929	32	-	4130	11196	43	-	235	15604
Cruise 5609:										
120.35	1028	-	-	-	1126	-	-	-	16	1142
120.40	70	-	-	-	70	-	-	-	0	70
Total	1098	-	-	-	1196	-	-	-	16	1212
Cruise 5610:										
93.27	0	6	58	-	0	6	71	-	0	77
Total	0	6	58	-	0	6	71	-	0	77

RECORD OF SARDINE LARVAE, 1956

Sardine larvae are reported by size in table III. The size classes of larvae have the following midpoints and ranges:

Midpoint (in mm.)	Range (in mm.)	Midpoint (in mm.)	Range (in mm.)
3.00	2.00-4.25	12.75	12.26-13.25
4.75	4.26-5.25	13.75	13.26-14.25
5.75	5.26-6.25	14.75	14.26-15.25
6.75	6.26-7.25	15.75	15.26-16.25
7.75	7.26-8.25	17.25	16.26-18.25
8.75	8.26-9.25	19.25	18.26-20.25
9.75	9.26-10.25	21.25	20.26-22.25
10.75	10.26-11.25	23.25	22.26-24.25
11.75	11.26-12.25	25.25	24.26-26.25

Dis. - Disintegrating larvae that cannot be measured accurately.

The distribution and relative abundance of sardine larvae in 1956 are shown in figure 3. The same categories of abundance are used as in the preceding report (Ahlstrom and Kramer 1957: fig. 3, p. 22). The value for each station is the cumulative standard haul total for the year.

In the preceding report it was pointed out that the distribution of sardine larvae is somewhat different than the distribution of eggs. Both sardine eggs and larvae are passively carried along by the currents. Since the direction of flow is predominantly southward, the distribution of larvae is displaced toward the south. A comparison of the occurrences and relative abundance of sardine eggs and larvae in different parts of the survey area is given in the following tabulation:

Station lines	Sardine eggs			Sardine larvae		
	occurrences	number	percent	occurrences	number	percent
40-77	0	0	0	0	0	0
80-93	29	11,739	11.94	22	1,548	9.97
97-107	53	34,043	34.62	39	1,163	7.49
110-120	47	41,969	42.69	61	8,291	53.41
123-137	13	10,532	10.71	38	3,063	19.73
140-157	2	44	0.04	11	1,458	9.39
Total	144	98,327	100.00	171	15,523	99.99

A markedly smaller portion of the larvae than eggs was taken in the northern center: 17.5% as compared to 46.5%. The reverse was true in the southern part of the range (lines 123-157), where 10.8% of the eggs and 29.1% of the larvae were obtained. As in preceding seasons, there were more occurrences of sardine larvae than eggs: 171 occurrences of larvae as compared to 144 of eggs in 1956.

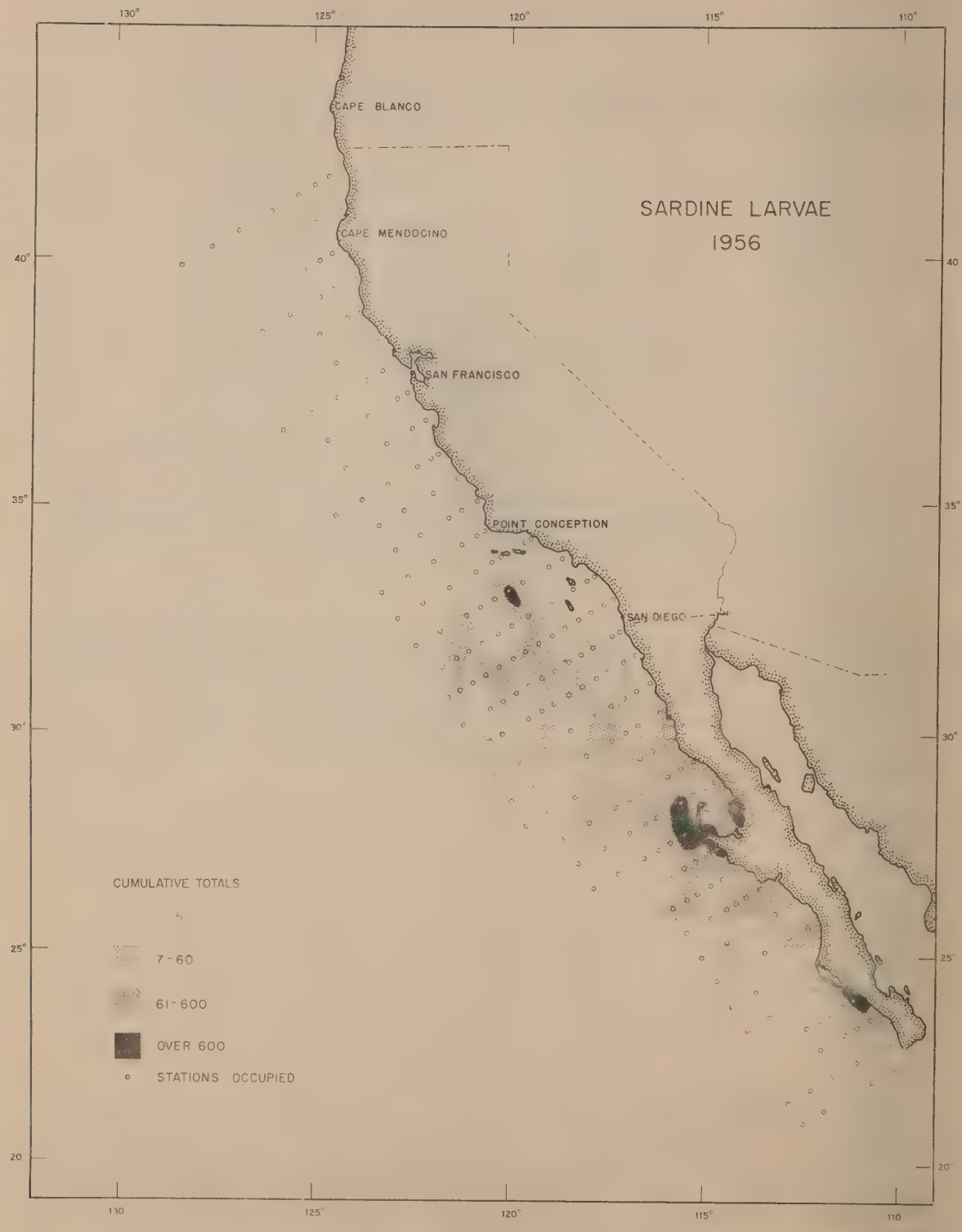

Figure 3.--Sardine larvae, 1956: Distribution and relative abundance

Text table 4.--Occurrence and abundance (standard haul totals) of sardine larvae, by month and area, in hauls made during 1956

Cruise	Northern and central California 40-77		Southern California 80-93		Northern Baja California 97-107		Upper central Baja California 110-120		Lower central Baja California 123-137		Southern Baja California 140-157		Total	
	occurrences	number	occurrences	number	occurrences	number	occurrences	number	occurrences	number	occurrences	number	occurrences	number
5601	-	-	0	0	0	0	4	100	5	59	2	970	11	1,129
5602	-	-	0	0	0	0	7	1,704	5	765	7	479	19	2,948
5603	-	-	0	0	10	147	12	506	8	346	-	-	30	999
5604	0	0	0	0	4	71	6	654	2	45	2	9	14	779
5605	0	0	7	220	8	270	4	288	0	0	-	-	19	778
5606	0	0	13	1,311	10	315	3	220	2	76	-	-	28	1,922
5607	0	0	1	11	7	360	8	1,129	2	12	-	-	18	1,512
5608	-	-	-	-	-	-	12	3,624	8	791	-	-	20	4,415
5609	-	-	-	-	-	-	5	66	6	969	-	-	11	1,035
5610	-	-	1	6	0	0	-	-	-	-	-	-	1	6
5611	-	-	0	0	0	0	-	-	-	-	-	-	0	0
5612	-	-	0	0	0	0	-	-	-	-	-	-	0	0
Total	0	0	22	1,548	39	1,163	61	8,291	38	3,063	11	1,458	171	15,523
Percent		0		10.0		7.5		53.4		19.7		9.4		100.0

Table III
Record of Sardine Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	3.00	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	25.25	Dis.	Total
Cruise 5601:																				
117.50	3.2		6.5																	9.7
120.40	15.9	10.8	7.5	7.5	1.1															42.8
.45			3.3																	3.3
.50			9.5			3.2	9.4	12.6	3.2	6.3										44.2
123.37		8.9																		8.9
.40	2.8	2.8																		5.6
127.34		2.8	2.8																	5.6
.55							5.9													5.9
137.23		12.5	10.0	2.5		7.5														32.5
143.26	87.1	270.7	19.1				1.4	1.4	5.5	5.4		4.1								394.7
147.20	15.8	400.1	144.9	3.2		3.2	3.2		3.2					3.2						576.8
Total	124.8	708.6	203.6	13.2	1.1	13.9	19.9	14.0	11.9	11.7		4.1		3.2						1130.0
Cruise 5602:																				
110.40			6.4																	6.4
113.60		8.2	5.5	8.2	19.2	8.2				2.7			2.7							54.7
.70		2.9	5.8	26.4	17.5		5.9													58.5
117.40	57.9	212.1	96.4			19.3	19.3	96.4		38.6		38.6	38.6							617.2
.50	67.0	16.0	3.2																	86.2
120.40	102.5	233.0	18.6	9.3																363.4
.45	12.2	24.3	60.8	54.7	48.6	66.9	97.3	42.5	18.3	12.2			18.3	36.6	6.1	12.2	6.1			517.1
123.36	96.4	48.2						9.6												154.2
.42	430.9	6.8																		437.7
.50			2.7			8.1	5.4	5.4	10.9	8.1	5.4	8.2	5.4	2.7						62.3
127.55		10.4	20.8							20.8	20.9	20.9		10.4						104.2
130.30	5.8																			5.8
140.60																			2.8	2.8
143.26					5.7	3.8														9.5
147.20	6.7			20.0	53.4	53.4	20.1	13.4			6.7									173.7
.25							10.2													10.2
150.19			11.8	141.6	59.0															212.4
.25					6.3	25.3	3.2	3.2			3.2	3.2	9.5	3.2						57.1
.30				4.7				4.7			4.7									14.1
Total	779.4	561.9	232.0	264.9	209.7	185.0	161.4	175.2	29.2	82.4	40.9	70.9	74.5	52.9	6.1	12.2	6.1		2.8	2947.5

Table III (cont'd)
Record of Sardine Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	3.00	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	25.25	Dis.	Total
Cruise 5603:																				
100.50	3.0	18.1	6.0																	27.1
B103.50		8.8																		8.8
S103.50																			6.4	6.4
B103.70		6.0	3.0	6.0																15.0
B103.80		3.3	3.3																	6.6
S103.80				3.9	3.9															7.8
B103.90					3.0															3.0
107.32	3.3			3.3																6.6
.50	19.8	13.2	3.3																	36.3
.60	12.9	16.2																		29.1
110.33	2.9																			2.9
.35	2.8																			2.8
.40		6.5																		6.5
.60		11.2	5.6				5.6													22.4
.70		5.7	5.7																	11.4
113.45		6.4								3.2										9.6
.50		6.0			3.0	3.0														12.0
.55		4.4	8.8	13.2																26.4
117.55					13.6										13.6					27.2
120.30	12.8																			12.8
.40	93.7	9.4							4.7											107.8
.45	222.3	19.5	15.6	3.9	3.9															265.2
123.37	2.9	23.2	14.5																	40.6
.40	39.2	110.8	58.7																	208.7
.45	25.2	18.8	12.6																	56.6
.50					18.4															18.4
127.34					2.6															2.6
.40																3.2				3.2
130.40													3.1							3.1
133.60				6.6	6.5															13.1
Total	440.8	287.5	137.1	36.9	54.9	3.0	5.6		4.7	3.2			3.1		13.6	3.2			6.4	1000.0

Table III (cont'd)
Record of Sardine Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	3.00	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	25.25	Dis.	Total
Cruise 5604:																				
100.80	3.7																			3.7
.90	19.2	12.8	6.4																	38.4
103.30		2.2																		2.2
.40	10.0	16.7																		26.7
110.35						3.0														3.0
113.40	2.4	7.3	2.4	4.9																17.0
117.35		20.7																		20.7
.40			2.7																	2.7
120.45	54.1	108.1	27.0		27.0															216.2
.50	46.2	255.7	92.4																	394.3
123.37		7.4																		7.4
127.50		16.5	22.0																	38.5
143.40																4.4				4.4
153.16																	5.4			5.4
Total	135.6	447.4	152.9	4.9	27.0	3.0										4.4	5.4			780.6
Cruise 5605:																				
90.75		12.8																		12.8
.80		9.5																		9.5
93.40							3.8													3.8
.55	4.6	4.6																		9.2
.60	13.7	27.4																		41.1
.70	56.0	67.2																		123.2
.75	6.8	13.6																		20.4
97.45											3.8									3.8
.55	27.0		3.8																	30.8
100.55												23.0								23.0
.60										6.1										6.1
.85	3.2																			3.2
103.45	2.9	49.6	26.3			14.6	32.1	23.4	5.8	2.9										157.6
.50		9.4		3.1	9.4		3.1													25.0
107.90						9.8			9.8											19.6
118.39	20.5	102.6																		123.1
120.30			42.7	85.4	28.5															156.6
.45												3.6								3.6
.60															3.5					3.5
Total	134.7	296.7	72.8	88.5	37.9	24.4	39.0	23.4	15.6	9.0	3.8	26.6			3.5					775.9

Table III (cont'd)
Record of Sardine Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	3.00	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	25.25	Dis.	Total
Cruise 5606:																				
87.55	302.4	291.6	183.6	43.2																820.8
.60										5.7				5.7						11.4
.70		11.0																		11.0
.80			2.8																	2.8
90.55	63.0	72.0		9.0	9.0					9.0										162.0
.75a			3.2																	3.2
.80a			10.4		20.8	17.3	17.3	20.8	6.9	3.5					3.5					100.5
.85													2.6							2.6
93.60	22.8	5.7																		28.5
.65	17.1	34.2																		51.3
.70							19.6													19.6
.75		14.1				9.4	23.4													46.9
.85		6.9	13.8			6.9		20.7												48.3
97.40	2.0			4.1		2.0				2.0										10.1
.50	6.0	3.0				3.0						9.0	15.1	12.0						48.1
.60	57.4	90.2	2.0	6.1		4.0				2.0										161.7
.75	8.4	8.4	8.4					8.4						4.2						37.8
100.60												2.8		2.8	2.8					8.4
.65							9.4													9.4
103.35	2.8																			2.8
107.32		3.6																		3.6
.45		6.0																		6.0
.50		19.8	6.6																	26.4
110.33				6.4		6.4														12.8
.45		14.9																		14.9
120.40	83.6	83.6	16.7	8.4																192.3
127.60		60.6																		60.6
137.30	10.2	5.1																		15.3
Total	575.7	730.7	247.5	77.2	29.8	49.0	69.7	49.9	6.9	22.2		11.8	17.7	24.7	6.3					1919.1
Cruise 5607:																				
93.85														11.2						11.2
97.40		2.4			2.4						2.4									7.2
.60											39.0				39.0	39.0				117.0
.70														16.6						16.6
100.29								4.7												4.7
.30									17.2	17.2										34.4

Table III (cont'd)
Record of Sardine Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	3.00	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	25.25	Dis.	Total
Cruise 5607 (cont'd):																				
103.30	4.5																			4.5
107.32	122.3	30.6	22.9																	175.8
110.35	34.6	25.9							8.6		8.6									77.7
.45		98.2	49.1	24.6																171.9
113.30		4.3	38.7	86.0	64.5	51.6	30.1	17.2	21.5	8.6										322.5
.35								9.0						9.0						18.0
117.26	27.5	137.6	20.7	6.9	13.8		13.8													220.3
120.25	158.4				22.6	22.6														203.6
.30				47.7									23.8							71.5
.40			8.5	17.0			8.5	8.5												42.5
133.30			2.5																	2.5
137.30										10.2										10.2
Total	347.3	299.0	142.4	182.2	103.3	74.2	52.4	39.4	47.3	36.0	50.0		23.8	36.8	39.0	39.0				1512.1
Cruise 5608:																				
110.35									5.0											5.0
113.30			3.0																	3.0
115.27	23.8	55.6	23.8	7.9	7.9	23.8														142.8
117.26	7.4		14.8	7.4	14.8															44.4
.40		6.0																		6.0
118.25			37.8			37.8	37.8													113.4
.30			6.3		3.2															9.5
.35	1977.3	240.5																		2217.8
120.25	496.2	264.0	105.6	10.6																876.4
.30						28.9														28.9
.35		6.2	3.1	3.1																12.4
.40	127.7	29.1	2.2	2.2	4.4															165.6
123.37					11.4	11.4	22.7	34.1	34.1	34.1	22.8		22.8							193.4
.42													5.9							5.9
127.34			9.4				18.8	9.4												37.6
130.30	17.8	10.7	3.6	10.7	39.2	24.9	32.1	17.8	39.2	14.2		3.6								213.8
.35			14.3	28.6	14.3		14.3			14.3	28.6	14.3	14.3	14.3						157.3
.40		6.1	6.1	24.5	30.6		6.1													73.4
137.23				10.5			63.1	10.5		10.5										94.6
.30									14.7											14.7
Total	2650.2	618.2	230.0	105.5	125.8	126.8	194.9	71.8	93.0	73.1	51.4	17.9	43.0	14.3						4415.9

Table III (cont'd)
Record of Sardine Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	3.00	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	25.25	Dis.	Total
Cruise 5609:																				
113.30	2.4		7.3	4.9																14.6
115.27						4.1	8.1													12.2
118.25		5.8																		5.8
120.40	15.6	3.9	3.9	3.9																27.3
.45									6.0											6.0
123.37				66.4	221.6	315.8	99.7	49.9	44.4	11.0			5.5							814.3
.42				13.1	26.2	13.0	26.1	6.5												84.9
.45								14.6			7.3	7.3			7.3					36.5
130.30			2.2	6.5																8.7
.35							6.6		6.6											13.2
.45						6.2						6.2								12.4
Total	18.0	9.7	13.4	94.8	247.8	339.1	140.5	71.0	57.0	11.0	7.3	13.5	5.5		7.3					1035.9
Cruise 5610:																				
93.27	6.5																			6.5
Total	6.5																			6.5

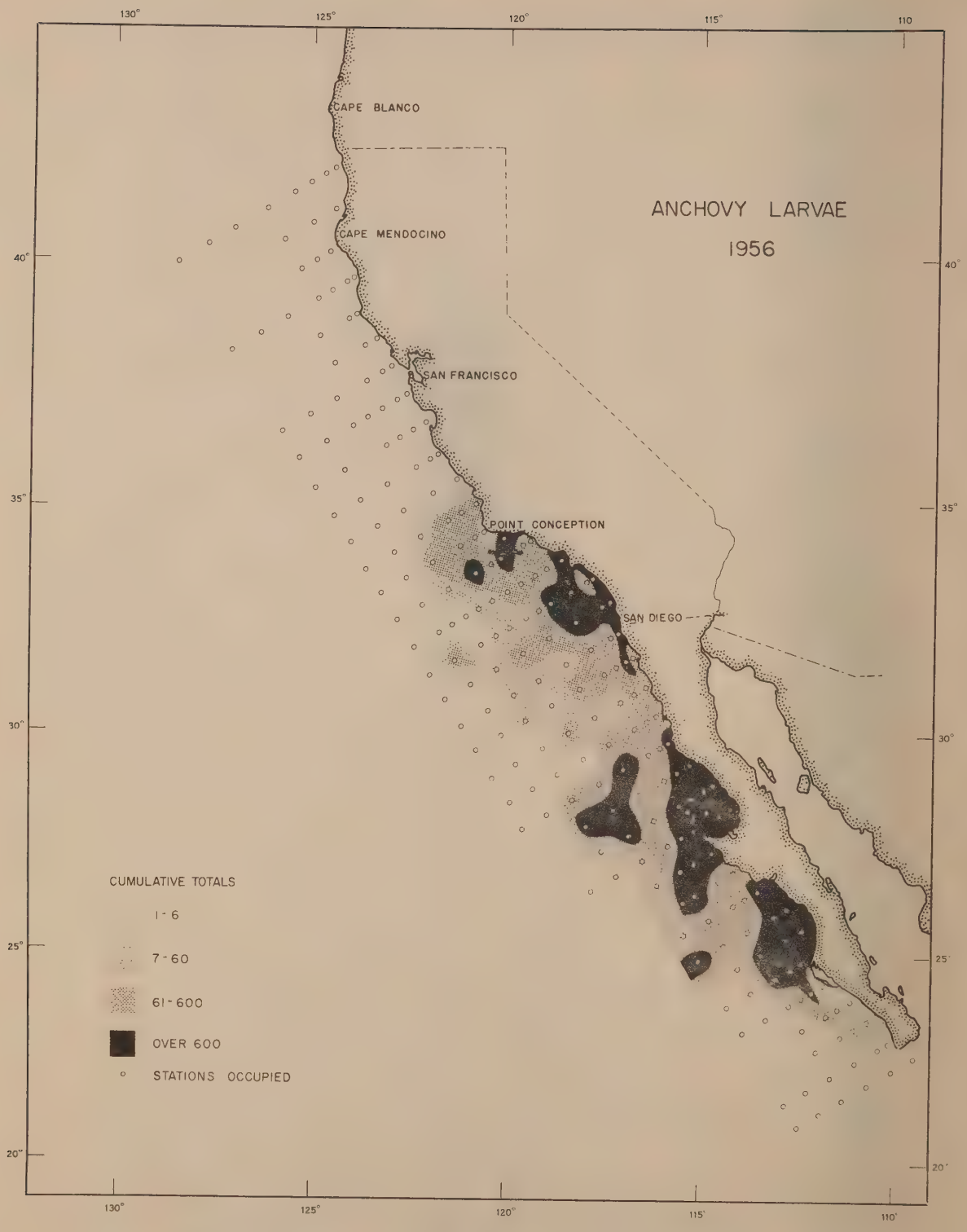

Figure 4.--Anchovy larvae, 1956: Distribution and relative abundance

RECORD OF ANCHOVY LARVAE, 1956

Anchovy larvae are recorded by size in table IV. The size classes have the same midpoints and ranges as those used for sardine larvae, with one exception: The first category defined for sardine larvae is divided into two size classes for anchovy larvae with the following midpoints and ranges: 2.50 mm. (1.76-3.25 mm.) and 3.75 mm. (3.26-4.25 mm.).

The distribution and relative abundance of anchovy larvae are shown in figure 4. Six categories of abundance are used, as shown in an insert on the chart. The value for each station is the cumulative standard haul total for the year.

The occurrence and abundance (standard haul totals) of anchovy larvae during 1956 are summarized by month and area in text table 5. A comparison with other larvae covered in this report follows:

Larvae	Total occurrences	Standard haul totals	Percent of total
Anchovy	536	134,931	33.06
Hake	360	89,857	22.02
Rockfish	614	29,144	7.14
Sardine	171	15,523	3.80
Jack mackerel	215	8,027	1.97
Pacific mackerel	40	1,519	0.37
All others	-	129,139	31.64
Total		408,140	100.00

Anchovy larvae have ranked first in abundance for a number of years, with hake larvae second in abundance. Rockfish larvae were taken in more hauls than anchovy larvae, however: 614, as compared to 536.

There are interesting differences in the distribution of anchovy larvae in 1955 and 1956. The number and percent taken in different parts of the survey area in the two years follow:

Area	1956		1955	
	Number	Percent of total	Number	Percent of total
Lines 60-77	629	0.5	38	0.03
Lines 80-93	17,838	13.3	30,147	21.5
Lines 97-107	8,463	6.3	30,092	21.5
Lines 110-120	61,565	45.8	68,568	48.9
Lines 123-137	20,884	15.1	11,269	8.0
Lines 140-157	25,552	19.0	69	0.05
Total	134,931	100.0	140,183	99.98

Considerably fewer anchovy larvae were taken in the northern half of the survey area (lines 60-107) in 1956: 20.1% as compared to 43.03% in 1955. The most interesting difference is in the number taken off southern Baja California (lines 140-157). Only negligible numbers were taken in this area in 1955 (0.05%), while 19.0% of the total occurred in this area in 1956.

Text table 5.--Occurrence and abundance (standard haul totals) of anchovy larvae (Engraulis mordax), by month and area, in hauls made during 1956

Cruise	Northern and central California 40-77		Southern California 80-93		Northern Baja California 97-107		Upper central Baja California 110-120		Lower central Baja California 123-137		Southern Baja California 140-157		Total	
	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber
5601	-	-	12	770	9	363	14	462	11	1,146	4	6,103	50	8,844
5602	-	-	12	366	8	74	19	9,596	16	5,949	11	13,154	66	29,139
5603	-	-	22	1,691	19	2,093	29	7,470	22	5,386	-	-	92	16,640
5604	0	0	16	2,262	11	3,011	17	10,236	14	1,053	8	6,295	66	22,857
5605	0	0	20	2,475	15	842	19	5,814	12	2,807	-	-	66	11,938
5606	1	2	18	3,803	11	571	10	12,401	12	1,483	-	-	52	18,260
5607	4	627	27	3,957	8	1,498	13	7,280	9	1,358	-	-	61	14,720
5608	-	-	-	-	-	-	19	8,001	8	1,634	-	-	27	9,635
5609	-	-	-	-	-	-	11	305	3	68	-	-	14	373
5610	-	-	18	825	0	0	-	-	-	-	-	-	18	825
5611	-	-	12	1,423	0	0	-	-	-	-	-	-	12	1,423
5612	-	-	11	266	1	11	-	-	-	-	-	-	12	277
Total	5	629	168	17,838	82	8,463	151	61,565	107	20,884	23	25,552	536	134,931
Percent		0.5		13.3		6.3		45.8		15.1		19.0		100.0

Table IV
Record of Anchovy Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	2.50	3.75	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	Dis.	Total
Cruise 5601:																				
80.51								3.4												3.4
83.40				7.4																7.4
.43				6.3	10.5	4.2														21.0
.51				4.6	9.2	16.1		2.3	4.6	2.3		2.3								41.4
87.36	3.6	51.0	10.9	3.6																69.1
.50											2.1	2.1								4.2
90.28	43.2	164.1	95.0	8.6																310.9
.30		23.8																		23.8
.37			25.8	51.6																77.4
.45		25.0				49.9														74.9
93.27	2.6	108.4	2.6		2.6		2.6													118.8
.40		9.6		9.6																19.2
97.30	14.2	56.7																		70.9
.40				12.1																12.1
100.29							9.9													9.9
.30		6.4				6.4		6.4	6.4											25.6
.50			7.1	49.7	49.7	7.1	21.3													134.9
103.30		24.3	12.2	3.0																39.5
107.32					11.5			11.5												23.0
.35				20.8																20.8
.40							8.4	16.8												25.2
110.33	2.3	2.3	4.6						2.3		2.3									13.8
.40			2.8									2.8								5.6
113.35							3.6													3.6
.40									6.0											6.0
.50									5.5	5.5										11.0
117.30	5.5	8.3	2.8																	16.6
.35	26.1	33.9							5.2											65.2
.40						10.5		10.5												21.0
.50		3.2			3.2															6.4
118.39	34.2	73.2																		107.4
119.33					3.0				6.1	3.0										12.1
120.25						3.2	6.4	6.4	3.2		3.2	3.2								25.6
.30								2.8		2.8	5.6	2.8								14.0
.50	50.4	104.0																		154.4
123.37				2.2				2.2												4.4
127.34				5.6	22.5	47.8	19.6	45.0	8.4	2.8			2.8							154.5
.40				2.5																2.5
.55		47.3			5.9															53.2
130.30	5.2	41.8	70.5	88.8	52.2	26.0	13.0	5.2												302.7
.35			12.7	15.9	3.2		3.2													35.0

Table IV (cont'd)
Record of Anchovy Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	2.50	3.75	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	Dis.	Total
Cruise 5601 (cont'd):																				
130.50				4.3																4.3
133.25	26.9	89.6	116.5	53.7	49.3	22.4														358.4
.40	3.7																			3.7
137.23	2.5	12.5	34.8	79.7	54.8	32.4	2.5	5.0												224.2
.30																			4.3	4.3
140.30				14.3	14.3	24.9	7.2	7.1	3.6	7.1										78.5
.35			62.2	758.8	1691.8	1393.3	1032.5	572.2	273.7	174.2	49.8									6008.5
.40				2.3	4.6			4.6												11.5
150.19	4.9																			4.9
Total	225.3	885.4	460.5	1205.4	1988.3	1644.2	1130.2	701.4	325.0	197.7	63.0	13.2	2.8						4.3	8846.7
Cruise 5602:																				
82.47					2.2															2.2
83.43		14.9	6.0	8.9		3.0														32.8
87.40				25.2	25.2		25.2	25.2												100.8
.50			5.8	2.9	2.9		2.9	5.8	2.9											23.2
90.28				2.7		8.2	5.4	8.2	8.2	8.2										40.9
.30		11.3																		11.3
.37	27.2	13.6																		40.8
.45	5.5																			5.5
93.27			2.4	2.4		2.4		4.7												11.9
.30		14.0																		14.0
.40	5.5					5.5	16.5	5.5	5.5			5.5								44.0
.50					2.7		13.5	13.5	8.1											37.8
97.30		2.2			2.2															4.4
.50							5.8		2.9											8.7
.60							3.4	3.4												6.8
100.29					2.9			2.9	2.9											8.7
.33							14.7					14.7								29.4
.40									2.5											2.5
103.30								2.9												2.9
.40						2.8				5.7		2.8								11.3
110.35		10.9																		10.9
113.30		8.2	4.1																	12.3
.35				22.2	11.1	11.2	16.7													61.2
.40						2.9	5.8	2.9												11.6
.50	6.1	12.2	24.4	30.5	6.1															79.3
.60	5.5	43.8	24.6	30.1	16.4	22.0	19.2	19.2	2.7	8.2	2.7	2.7								197.1
.70	26.4	401.4	208.0	161.1	82.1	26.3	17.6	20.5	17.6	2.9			5.9		2.9					972.7

Table IV (cont'd)
Record of Anchovy Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	2.50	3.75	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	Dis.	Total
Cruise 5602 (cont'd):																				
117.26		36.3	31.8	13.6	22.7	4.5	9.1	9.0	4.5	4.5	13.6	4.5								154.1
.30			3.1	3.1	3.1			3.1			3.1									15.5
.35		11.5	69.1	17.3	17.3	5.8	5.8		23.0	5.8										155.6
.40	289.2	520.6	404.9	269.9	212.1	212.1	134.9	96.4	173.5	134.9	38.6	19.3		19.3						2525.7
.50			6.4			3.2														9.6
118.39	392.0	644.0	666.4	218.4	229.6	162.4	100.8	33.6	50.4	22.4										2520.0
119.33		20.2	5.0	10.0		25.2	5.0													65.4
120.25					9.9		4.9					4.9								19.7
.30		11.4			22.8															34.2
.40	37.3	74.6	74.6	83.9	46.6	65.2	56.0	46.6	9.3	9.3										503.4
.45	231.1	650.6	401.3	225.0	206.7	145.9	103.4	91.2	73.0	48.6	24.4	12.2	12.2		6.1	12.2				2243.9
.70			2.1																	2.1
123.37	9.6		28.9			19.2		9.6	19.3											86.6
.42	690.8	130.0					6.8	6.8	13.7	13.7	20.5									882.3
.50	2.7	35.3	266.5	206.7	138.7	95.2	73.5	29.9	27.2	8.1										883.8
127.40							5.2			2.6										7.8
.50	2.8	22.5	149.4	253.8	197.4	76.1	70.5	22.6	5.6	2.8										803.5
.55	20.9	365.4	469.8	177.5	146.1	73.1	73.1	104.4	114.9	94.0	41.8		41.7							1722.7
130.30	17.6	55.9		2.9		2.9														79.3
.35																			2.5	2.5
.50		2.7	8.0	61.4	64.0	21.4	8.0	8.0	10.6	2.7										186.8
.60						3.4				3.4										6.8
133.25	6.2	12.4	6.2				6.2	3.1												34.1
.30	148.2	205.2	136.8	11.4		11.4														513.0
.40			2.7			2.7													2.7	8.1
137.23		2.9				8.8	5.9													17.6
.30				26.2	52.4	105.0	105.0	52.4			26.2									367.2
.40	6.8	122.1	166.1	37.3	13.6															345.9
140.30			102.7	430.1	2189.2	2568.0	1322.5	609.9	288.9	134.8	83.5	38.5	25.7							7793.8
.35		14.3	150.3	486.9	766.1	766.2	544.1	372.4	272.1	221.9	229.1	93.1	50.1	21.5	7.2	7.2				4002.5
.40				6.0	23.9	53.6	154.9	184.8	280.1	119.2	65.5	11.9	11.9		23.9	6.0				941.7
.50									2.2											2.2
143.30					12.5	49.9	37.5	25.0		12.5										137.4
.35			10.2	10.2	25.5	10.2	15.3	15.3												86.7
.60						3.4	3.4													6.8
147.25							10.2	10.2	15.2	5.1		5.1								45.8
.30								11.2	33.8	22.5	22.4	5.6	16.8		5.6					117.9
150.19															5.9					5.9
.25									3.2	6.3				3.2						12.7
Total	1931.4	3470.4	3437.6	2837.6	4554.0	4579.1	3008.7	1860.2	1473.8	900.1	571.4	220.8	164.3	44.0	51.6	25.4			5.2	29135.6

Table IV (cont'd)
Record of Anchovy Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	2.50	3.75	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	Dis.	Total
Cruise 5603:																				
80.55								3.1				6.2								9.3
.60								8.1	18.9	10.8	13.5		2.7	5.4	5.4					64.8
.70								3.2											3.2	6.4
82.47					8.9	14.8	26.7	14.8	6.0	8.9						3.0				83.1
83.43				2.8	2.8	13.9	2.8		2.8											25.1
.51					37.4	69.4	90.8	101.4	37.4	16.0	16.0									368.4
.60						6.0				6.0										12.0
87.36				14.8	88.9	64.2	29.6	4.9												202.4
.40					19.1	6.4	12.8													38.3
.50					4.4	9.0	11.2	13.4	15.7	13.5	8.9									76.1
90.28	42.5	15.9	13.3		5.3	5.3		10.7	2.7											95.7
.30										3.1										3.1
.37						11.4		11.4			11.4									34.2
.45							13.0	19.5	6.5	6.5	6.5									52.0
.55									6.1		12.2	6.1								24.4
.60					15.9															15.9
.80			9.4	12.5	3.1	3.1	9.4	12.5	3.1	6.3	6.3	6.3								72.0
93.27	2.9		2.9	14.5	14.5	5.8	8.7	2.9												52.2
.30	4.1	4.1		4.1		12.3														24.6
.40			2.7	8.2		2.7														13.6
.60			11.6	40.8	34.9	69.9	81.5	69.8	46.6	29.1	11.6	5.8	11.6							413.2
.70							5.6													5.6
97.30	15.2	43.4	13.0	26.0	15.2	15.2	6.5	15.1	8.6	2.2	2.2									162.6
.32					3.0			11.9	3.0	6.0	3.0									26.9
.50								3.0												3.0
.60							2.9													2.9
.70				6.1	9.2	24.5	3.1	9.2			3.1									55.2
100.29			17.9	41.8	24.0	18.0	6.0	18.0	18.0	12.0			6.0							161.7
.33		30.4	6.0	18.2	12.2		3.0	3.0	6.1											78.9
.40							3.0													3.0
.60							3.3													3.3
.70						11.2		5.6												16.8
.80					3.0															3.0
S100.90											6.1									6.1
103.30		14.9	74.6	44.7	44.7	29.8	44.8	29.8	14.9		14.9									313.1
.35	80.9	34.7	23.1		11.6	23.1	23.2	11.6	11.6											219.8
.40						24.6		12.3												36.9
107.32		3.3	26.4	52.8	69.3	46.2	46.2	23.1	13.2	13.2		3.3								297.0
.35			50.4	67.2	84.0	25.2	58.8	42.0	16.8	50.4	8.4	8.4								411.6
.40		41.4		13.8				13.8												69.0
.50		16.5	75.9	85.8	33.0	6.6	3.3													221.1

Table IV (cont'd)
Record of Anchovy Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	2.50	3.75	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	Dis.	Total
Cruise 5603 (cont'd):																				
110.33	14.3	57.2	31.5	5.8	14.3	20.0	2.9	2.9												148.9
.35		14.1	76.2	93.0	64.8	25.4	16.9	8.4	8.4											307.2
.40			9.8		6.6		3.3	6.5		3.3			6.5							36.0
.50	102.6	433.2	433.2	239.4	45.6		22.8	34.2	11.4	11.4	22.8									1356.6
.60	22.3	55.8	61.4	50.2	50.2	5.6	11.2	22.3	16.8	16.8				5.6						318.2
.70		11.4	22.9	28.6	17.1			34.4	5.7	5.7										125.8
113.30	6.5	10.8	21.6	28.1	38.8	13.0	2.2			2.2										123.2
.35	46.5	139.7	104.8	128.0	244.4	162.9	34.9	11.6												872.8
.40			14.1	28.2		14.1	28.2	28.2		28.2		14.1								155.1
.45				3.2																3.2
.50			6.0		9.0	6.0	6.0	15.0	21.0	21.0	3.0	6.0		3.0						96.0
.55	39.5	61.3	26.3	17.5	21.9	8.8	13.2	13.2	21.9	35.0	17.6	8.8		4.4	4.4					293.8
.60	192.9	446.2	257.3	80.4	36.2	12.0	12.0	12.0				4.0								1053.0
.80															3.6					3.6
117.26							5.5	11.0	11.0	11.0	5.5	5.5								49.5
.30		17.6	17.7	5.9	5.9	11.8	11.8	5.9	23.5	52.9	17.6	11.8								182.4
.35	42.6	42.6	170.3				42.6													298.1
.40	176.4	332.8	10.1	20.2	5.0			5.0	5.0											554.5
.45	3.2	6.4	3.2	3.2	3.2	3.2														22.4
.50		29.5		5.9	5.9	11.8	11.8		5.9	11.8	11.8					5.9				100.3
.55		40.7	40.7	81.3	13.6		13.6	13.6				40.7	13.6							257.8
.60	27.9		27.9	139.6	251.3	167.6	55.8													670.1
.70				3.3	16.3	3.3						3.3	3.3							29.5
118.39		2.6			2.6					2.6										7.8
119.33			5.2						5.2											10.4
120.25								45.1	135.4		45.1			45.1						270.7
.30							12.8	51.0	38.3	12.8										114.9
.40												4.7								4.7
.45			3.9																	3.9
123.37		8.7	2.9	2.9				8.7	14.5	29.0	14.5	2.9			2.9					87.0
.40		16.3	6.5				3.3	22.8	9.8	6.5	3.3									68.5
.45	12.6	18.9	12.6	25.1	25.2	6.3	12.6	12.6	6.3			6.3								138.5
.50			6.1	6.1	6.1			6.1												24.4
127.34				2.6			2.6	10.6	2.6		2.6		2.6							23.6
.40			9.7	16.3	9.7	16.3	16.2	13.0	3.2	9.7	6.4									100.5
.50	3.6	14.6																		18.2
.55	5.6	28.1																		33.7
.60	2.8	8.5																		11.3
130.30	17.5	30.0	10.0						2.5											60.0
.35		3.0																		3.0
.40					3.1	6.2	6.2	15.4												30.9

Table IV (cont'd)
Record of Anchovy Larvae, 1956

Station	Midpoint of Size Class (in mm.)																	
	2.50	3.75	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	Dis.	Total
Cruise 5603 (cont'd):																				
130.50		5.7	37.0	22.8	2.8		2.8	5.7	2.8											79.6
.60						13.0	9.7	6.5												29.2
133.25		20.0	20.0	3.3				3.3												46.6
.30	60.5	10.1	10.1																	80.7
.40	16.8	2.8									2.8									22.4
.50	5.5	19.3	2.8	8.3	11.0	5.6														52.5
.60	65.2	635.7	192.4	75.0	3.3	3.3	3.3		3.3	3.3										984.8
137.23					9.6		9.6													19.2
.30	111.6	1463.2	465.0	148.8	55.8	12.4	18.6	24.8	12.4	6.2										2318.8
.40	18.4	61.4	282.4	435.9	202.6	43.0	36.8	12.2	18.4		6.1	12.2		6.1		18.4				1153.9
Total	1140.4	4252.8	2728.8	2163.0	1726.3	1090.2	925.4	936.1	623.3	453.4	283.2	156.4	46.3	69.6	16.3	27.3			3.2	16642.0
Cruise 5604:																				
83.40	1.5	2.3				1.5		1.5												6.8
.43									5.7											5.7
.51							2.9	2.9	5.7		2.9									14.4
.55						3.3		3.3	6.6	3.3										16.5
87.36						6.6		6.6	6.6											19.8
.40					28.7	21.5	21.5		21.5	14.4	42.9	21.5						7.2*		179.2
.50									2.6	5.2	2.6		2.6	2.6						15.6
.60			7.6																	7.6
90.28	83.4	192.1	54.3	73.7	50.5	17.4	13.6	3.8	1.9	1.9										492.6
.30	5.9	23.5	23.4	41.0	41.0	5.9	5.9			5.9		5.9								158.4
.37		16.5	9.9	6.6	36.3	16.5	19.8	13.2	6.6	3.3										128.7
.45	2.8	57.8	121.0	123.7	44.0	49.5	38.6	30.2	38.5	44.0	13.8	5.5	2.8							572.2
93.27	128.1	280.6	48.8	30.5	12.2	24.4		6.1												530.7
.30	9.0	15.0	9.0	12.0	18.0	6.0	3.0	3.0			3.0									78.0
.40		3.7		3.7	3.7															11.1
.50						4.0	4.0	4.0	4.0	4.0			4.0							24.0
97.30	1434.7	711.4	117.6	58.8	41.1	11.8	11.8	11.8	5.9											2404.9
.32		2.9	46.6	5.8	2.9		5.8													64.0
.60														5.7						5.7
100.29					6.8	20.4		6.8	6.8	6.8										47.6
.33	3.2	38.9	51.8	42.2	9.7	6.5	3.2	3.2	3.2	3.2										165.1
.40		10.1	23.6	77.6	50.6	16.8	16.8	23.6	20.2	10.1	6.7	3.4	3.4							262.9
.50																3.3				3.3
103.30	2.2					6.6	6.6	6.6	2.2					2.2						26.4
.35						3.4	3.4								6.8					13.6
.50									3.2											3.2
.60								6.8			6.8									13.6

* - 27.25 mm. group

Table IV (cont'd)
Record of Anchovy Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	2.50	3.75	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	Dis.	Total
Cruise 5604 (cont'd):																				
110.33	52.3	78.5	143.9	65.4	39.3	26.2	13.1	39.3				13.1				13.1				484.2
.35		3.0		6.0	3.0	3.0		3.0			3.0	3.0		3.0						27.0
113.30		90.2	231.8	772.8	785.7	218.9	90.1	77.3	51.5	25.8										2344.1
.35	17.2	11.4		5.7				5.7												40.0
.40		2.4																		2.4
117.26						15.2	76.0	152.0	144.4	60.8	30.4	38.0								516.8
.30	15.0	10.0	20.0	15.0	55.0	35.0	35.0	15.0	30.0	25.0	15.0									270.0
.35	57.0	155.4	31.1	10.4	46.6	31.0	10.4	25.9	10.4	20.8	5.2	5.2								409.4
.40	26.6	18.7	13.3	93.1	31.9	8.0	5.4	2.7	2.7											202.4
.50									4.4	2.2										6.6
.60										2.3	2.3									4.6
.70								3.6												3.6
119.33	5.0		10.0	20.0	50.2	25.1	50.2	30.1	30.1	5.0	5.0									230.7
120.25				11.0	54.8	164.4	515.1	1118.0	887.8	438.4	175.4	87.7	32.9	22.0						3507.5
.30				45.0	30.0	15.0	30.0	22.5	15.0											157.5
.45	54.1	81.1	189.3	189.3	243.3	297.5	243.4	162.2	162.2	27.0	27.0		27.0							1703.4
.50	58.5	98.5	67.8	27.7	40.1	30.8		3.1												326.5
123.37							14.8	7.4		7.4					7.4					37.0
.40					14.3	4.8	21.4	19.0	14.3	2.4	2.4									78.6
.42								4.3												4.3
.50				5.1	15.3	35.8	41.0	25.6	25.6	15.3	5.1									168.8
.60				2.6	2.6	10.3	2.6	7.7	7.7							2.6				36.1
127.40	12.1								12.1	24.2										48.4
.50			16.5	22.0	5.5	5.5	11.0		5.5		11.0									77.0
130.30									36.1		14.4	7.2								57.7
.35									2.9											2.9
.50						2.8														2.8
.60							2.8	2.8												5.6
137.23	58.6	165.9	165.9	68.4			29.3	19.6												507.7
.30	23.3																			23.3
.40				3.2																3.2
140.30					5.7		17.2	5.7												28.6
.35	1181.9	1210.9	379.2	104.8	62.4	66.9	35.7	13.4	6.7											3061.9
.40		18.9	159.3	113.4	40.5	16.2	5.4	2.7												356.4
143.30			25.1	160.7	296.2	471.9	798.2	637.6	236.0	55.3	15.1	5.0								2701.1
.35					9.6	9.6	9.6	19.1	19.2	19.2	9.6			9.6						105.5
.40					2.2	4.4	4.4	6.6	4.4	2.2	2.2		2.2							28.6
147.25				4.8	2.4		2.4													9.6
157.50							3.1													3.1
Total	3232.4	3299.7	1966.8	2222.0	2182.1	1720.4	2224.5	2565.3	1850.2	835.4	401.8	195.5	74.9	45.1	14.2	19.0		7.2		22856.5

Table IV (cont'd)
Record of Anchovy Larvae, 1956

Station	Midpoint of Size Class (in mm.)																	
	2.50	3.75	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	Dis.	Total
Cruise 5605:																				
80.51						2.1														2.1
82.47						9.8	19.8				4.9									34.5
83.40	2.8	13.9	11.2	2.8			5.6													36.3
.43							7.2		3.6											10.8
.51					8.7			2.9	2.9		2.9		2.9		2.9					23.2
.55				5.6	11.2	8.4	8.4	16.8	19.6	11.2	8.4	8.4		2.8		2.8				103.6
87.36	12.6	12.6	10.1	10.2	2.5	5.0	2.5			2.5										58.0
.40		3.6				3.6	7.2	7.2		3.6	7.2									32.4
.45				3.0																3.0
.50										2.0										2.0
.75															2.0					2.0
90.28	166.4	241.2	124.8	282.9	158.1	33.2														1006.6
.30		3.2	3.2	3.2	9.5	3.2	3.2													25.5
.37	192.3	176.2	58.7	80.1	32.1	5.3	16.0	5.3	5.3	10.6										581.9
.45						66.6	33.3	99.9	33.3											233.1
.50						4.6		22.8	13.7	27.4	4.6	4.6	9.2		9.1					96.0
93.27	44.8	22.4	44.8	33.6	56.0															201.6
.30									3.0	6.0										9.0
.35				5.2																5.2
.75			6.8																	6.8
97.30	7.1	7.2		2.4	4.8															21.5
.32	34.7	31.2	24.3	17.3	24.3	20.8	13.9	6.9												173.4
100.29						5.6			5.6											11.2
.30	3.2		3.2		3.2	6.5	3.2	6.4												25.7
.35			3.1	3.1	3.1	15.3	33.8	43.0	46.1	27.7	9.2	6.2								190.6
.40					11.0	16.5	11.0	11.0	22.0	16.5										88.0
.45					6.0			18.1	6.0											30.1
.55			23.0	23.0																46.0
103.35			4.8																	4.8
.40										3.0				3.0						6.0
.45							2.9					2.9								5.8
.50									3.1	18.7	15.6	9.4		3.1						49.9
.55				9.4	6.3	3.2		6.3	9.4	6.4				3.2						44.2
.60				12.3	3.1	9.2	15.3	12.2	3.1	15.3	24.4	21.4	6.2		3.1					125.6

Table IV (cont'd)
Record of Anchovy Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	2.50	3.75	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	Dis.	Total
Cruise 5605 (cont'd):																				
107.32					9.4			9.4												18.8
110.33															23.8					23.8
.35				5.0	15.0	5.0	15.0	20.0		5.0										65.0
.40			5.0	5.0	5.0					5.0										20.0
113.30	13.9	60.2	9.3	9.3	13.9	13.9	4.6		4.6		4.6									134.3
.35			10.6	10.6	21.2															42.4
.40									5.6											5.6
.45			59.9	59.9	59.9	20.0		20.0	20.0	59.9										299.6
117.26	112.2	80.2	48.1	32.0	64.1	64.2	64.1		32.1											497.0
.30					106.1															106.1
.35			45.1	45.2																90.3
118.39				20.5				20.5												41.0
119.33					87.2	34.9		52.3	279.1	174.4	17.4	17.4	17.4							680.1
120.25	1822.0	299.5	224.6	74.9	50.0	25.0	49.9	74.9												2620.8
.30			113.9	356.0	142.4	99.7	85.5	114.0	57.0	14.2	28.5	14.2	14.2							1039.6
.40							3.4			3.4	3.4									10.2
.45							7.2	7.2	7.2	10.7	25.0	10.8								68.1
.50											24.2		12.1	12.1	12.1					60.5
.60									3.5				3.5							7.0
.70												2.9								2.9
127.40												3.0						6.0*		9.0
.45						3.2														3.2
130.30														6.1						6.1
.40															3.0					3.0
133.25	780.6	1047.2	171.3	19.0																2018.1
.30	53.3	135.3	28.7	8.2																225.5
.40	29.8	238.0	34.0																	301.8
.50							6.7	6.7		6.7				6.7		6.7	6.7			40.2
137.23		8.0	34.7	45.4	8.0	2.7														98.8
.30		13.2	39.5	19.7	6.6															79.0
.40			3.2	6.4			3.2													12.8
.50				3.3	3.3	3.3														9.9
Total	3275.7	2393.1	1145.9	1214.5	932.0	490.8	422.9	583.8	585.8	430.2	180.3	101.2	65.5	37.0	56.0	9.5	6.7	6.0		11936.9

* - 3.0 - 23.25 mm. group; 3.0 - 27.25 mm. group.

Table IV (cont'd)
Record of Anchovy Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	2.50	3.75	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	Dis.	Total
Cruise 5606:																				
63.52		2.0																		2.0
80.51								2.4												2.4
.70	17.3	4.3	13.0	13.0	21.7	8.7														78.0
82.47							5.0	10.0	10.0	5.0	10.0									40.0
83.51				5.5	5.5	5.5	5.5	5.5	44.2	27.6	11.0	22.0								132.3
87.36	113.4	123.4	83.5	51.7	33.8	6.0														411.8
.40			2.4	2.4	9.8	14.6	4.8	14.7	2.4	2.4		2.4								55.9
.45							2.7													2.7
.50									23.6						11.8					35.4
90.28	167.6	35.6	7.6	17.8	17.8	8.9	1.3													256.6
.30							9.6		9.6											19.2
.37					5.7	5.7	11.4	11.4	8.5	2.8										45.5
.45						18.7	18.7													37.4
93.27	27.8	2.3	6.9	6.9		6.9	6.9													57.7
.30	272.3	152.7	20.0	3.3	3.3	3.3														454.9
.35	260.0	29.2	2.4	2.4		9.7	2.4	2.4												308.5
.40	91.1	91.0	135.3	201.5	157.3	126.9	60.7	13.8	2.8	2.8	2.8									886.0
.45	288.1	273.4	273.5	82.3	35.3	11.8	2.9		2.9											970.2
.75	4.7									4.7										9.4
97.30	109.8	64.9	20.0	40.0	30.0	20.0	5.0		15.0	5.0	5.0	5.0								319.7
100.29											7.6									7.6
.33		2.4	19.4	7.2	16.9	2.4	4.8	2.4		2.4	4.8									62.7
.35						5.4			2.7											8.1
.65	9.4																			9.4
103.30										9.9										9.9
107.32		14.6		14.6	10.9	3.6			3.6											47.3
.35			5.7			5.7														11.4
.40				26.7		13.4		13.4												53.5
.45			6.0		6.0	6.0	6.0	6.0	6.0											36.0
.50							6.6													6.6
110.33																6.4				6.4
117.26		50.5	80.8	121.2	212.1	161.6	80.8	50.5	30.3	10.1										797.9
.30	457.2	2255.5	1117.6	152.4	294.6	670.5	629.9	467.3	243.8	10.2	20.3				10.2			10.2*		6339.7
.35								18.7												18.7
.40												6.6			6.6	13.3				26.5
.50																13.4				13.4
120.25	65.5	338.5	294.8	43.7	76.5	65.6	131.0	120.1	21.8											1157.5
.30				12.1	108.9	36.3	24.2													181.5
.40	367.8	384.5	560.1	852.8	852.7	259.2	158.8	41.8		25.1	8.4									3511.2
.45		3.5	3.5	7.0	14.1	3.5	17.7	56.6	77.9	67.3	56.6	28.4	7.0		3.5					346.6

* - 27.25 mm. group

Table IV (cont'd)
Record of Anchovy Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	2.50	3.75	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	Dis.	Total
Cruise 5606 (cont'd):																				
123.40				7.3		3.6		7.3				7.3		3.6		7.3				36.4
.42				24.6	24.6	24.5	49.1	8.2	8.2	8.2		8.2	16.4	16.4	8.2	8.2	8.2			213.0
.50											3.7									3.7
127.55			31.6				31.6													63.2
.60			15.2																	15.2
130.35	3.6	42.8	7.2																	53.6
.60														3.4						3.4
133.25				57.2	28.6	57.2	85.7	28.6												257.3
.30	6.0	53.8	35.8	12.0	18.0		18.0	12.0	6.0		6.0									167.6
137.23					23.4	23.4	23.4		23.4											93.6
.30	51.0	76.5	10.2	30.6	45.9	15.3	5.1													234.6
.40	31.5	189.0	85.5	18.0			4.5	4.5			4.5		4.5							342.0
Total	2344.1	4190.4	2838.0	1814.2	2053.4	1603.9	1414.1	897.6	542.7	183.5	140.7	79.9	27.9	23.4	40.3	48.6	8.2	10.2		18261.1
Cruise 5607:																				
77.50				36.4	27.4	45.6	33.4	24.3	6.1	6.0										179.2
.55		5.6	11.2	22.4	33.8	39.4	28.1	22.5	22.4		5.6	11.2	5.6							207.8
.60								18.5	18.5	49.2	36.9	12.4	24.6	12.3	12.4	6.2				191.0
.70					6.1				12.2	12.2	6.1	6.1	6.1							48.8
80.55				9.0	24.0	87.0	48.0	15.0	3.0											186.0
.60													5.2							5.2
82.47			28.1	18.7	140.4	93.6	37.4	28.1		9.4										355.7
83.40							1.4	2.8												4.2
.43		15.3	50.8	20.3	30.5	35.5	30.5	15.3												198.2
.48	5.2	26.1	23.5	18.2	10.4		2.6													86.0
.51		5.9		11.7	11.7	5.9	5.9	5.9												47.0
.55				11.0	76.7	87.6	54.8	54.8												284.9
.60		5.7			33.9	141.5	164.2	141.5	147.1	113.2	67.9	22.7	22.6		22.7	22.7				905.7
.70							12.7		12.7											25.4
87.36		15.6	26.1	10.4	20.8	13.0	2.6	7.8												96.3
.45		32.6	97.9	130.6	65.3															326.4
.50						30.9			15.4		15.4									61.7
.55					13.5	11.3	4.5		2.3											31.6
.60								4.0	4.0											12.0
.65					16.0	3.2	3.2	3.2											4.0	25.6
.75											3.0									3.0
90.28			33.6	67.2	89.6	78.4	11.2	11.2	22.4											313.6
.30				35.1	23.4	11.7														70.2

Table IV (cont'd)
Record of Anchovy Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	2.50	3.75	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	Dis.	Total
Cruise 5607 (cont'd):																				
90.37	12.6	37.8	50.4	37.8	63.0	88.2	37.8	12.6	25.2											365.4
.45				3.4	10.2	6.8														20.4
.50		6.0																		6.0
.65												11.6								11.6
93.27	7.0	16.5	4.8	18.8	68.2	77.5	47.0	39.9	18.8	4.7		4.8	2.4							310.4
.30	2.3	11.7	7.0	23.4	32.7	42.1	28.1	4.6	2.3	2.3										156.5
.35		6.7	4.5	4.5	6.7	11.2														33.6
.70																		13.6		13.6
97.30				19.2	38.2	9.6	28.7		9.6	9.6										114.9
.40	43.4	21.7	4.8	2.4	9.6	9.6														91.5
100.29						14.0	4.7	9.4		4.7	4.7									37.5
.30	8.6	17.2	43.0	86.0	111.8	129.0	120.4	172.0	163.4	163.4	77.4	25.8	17.2	8.6		8.6				1152.4
.35				22.2			22.2													44.4
.40								10.6												10.6
103.30	4.5			4.5																9.0
107.32	7.6	7.6			7.6	7.6			7.6											38.0
110.35		8.6	17.3	8.6		25.9	8.6	8.6	8.6		8.6	8.6								103.4
.45			49.2				24.6													73.8
113.30					8.6		21.5	77.4	60.2	77.4	21.5		4.3							270.9
.35				9.0		9.0				9.0										27.0
117.26					6.9	6.9	6.9													20.7
.30	146.1	422.3	349.1	186.7	97.4	89.3		8.1												1299.0
.35						26.5														26.5
.45								13.4												13.4
119.33		27.1	27.1	54.2	27.1	27.1	244.0	108.5							27.1	27.1				569.3
120.25	22.6	113.2	249.0	475.4	203.8	407.5	113.2	22.6												1607.3
.30		47.7	119.2	166.9	166.9	333.8	357.6	238.4	47.6	95.3		23.8			23.8					1621.0
.40		8.5	42.6	204.5	289.7	289.7	306.8	161.9	178.9	127.8	25.5			8.5						1644.4
.50		3.1																		3.1
123.37					90.6	67.9	22.6	90.5												271.6
.55					2.8															2.8
130.50							6.3													6.3
.60							2.7													2.7
133.25						73.3		329.8	146.6	109.9										659.6
.30		15.0	5.0	7.5	2.5	2.5		7.5	5.0	2.5										47.5
.40				12.6				12.6	25.2	12.6	25.2	25.1	12.6							125.9
137.23								22.9								22.9				45.8
.30								10.2	40.8	30.6	71.4	20.4	10.2		10.2					193.8
Total	259.9	877.5	1244.2	1738.6	1867.8	2439.6	1844.2	1716.4	1005.9	839.8	369.2	172.5	110.8	29.4	96.2	87.5		13.6	4.0	14717.1

Table IV (cont'd)
Record of Anchovy Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	2.50	3.75	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	Dis.	Total
Cruise 5608:																				
110.33		5.4	5.4	27.2	32.7	76.2	108.8	43.6	76.1	16.3	21.8	16.3	10.9	10.9						451.6
.35					10.0		15.0	5.0		10.0										40.0
.40				4.3	4.3	12.9	12.9													34.4
113.30	17.7	64.9	97.3	41.2	3.0															224.1
.35		3.2																		3.2
115.27	23.8	150.8	301.7	150.8	15.9	23.8	47.7	15.8	7.9											738.2
.30	947.8	517.0	114.8	201.0	114.9	287.2	143.6	143.6												2469.9
.35				11.4	11.4	3.8				7.6	3.8									38.0
.40									7.0											7.0
117.26	178.0	289.4	96.5	29.7	22.2	59.4	22.2	29.7	14.8	7.4										749.3
.30	15.6	31.2	15.6	31.2	62.4	46.8	31.2		31.2											265.2
.40			3.0																	3.0
118.25	37.8	151.1	188.8	75.6	75.6	75.6	37.8	37.8												680.1
.30	12.6	15.7	31.5	18.8	6.4	6.3	3.2	3.2												97.7
.35		80.2	133.6	106.9		13.4														334.1
120.25		158.4	95.1	52.8	63.4		10.6	10.6												390.9
.30		57.8	86.6	231.1	375.5	86.7	173.3		86.6	28.9	86.6	28.9			28.9					1270.9
.35		12.5	21.9	9.3	3.1															46.8
.40	4.5	47.0	49.3	18.0	26.8	6.7	2.2	2.2												156.7
123.37					22.7	56.8	11.4	11.4		11.4										113.7
127.34		9.4	18.8	9.4	9.4															47.0
130.30			7.1	49.9	160.2	277.7	110.4	24.9	7.2	3.6										641.0
.35						28.6	57.3	71.6	28.6	14.3	14.3	14.3								229.0
.40					6.1		18.3		12.2											36.6
133.25					3.8	3.8	3.8													11.4
137.23					52.6	126.3	220.9	84.2	10.5	10.5		10.5	10.5							526.0
.30						29.4														29.4
Total	1237.8	1594.0	1267.0	1068.6	1082.4	1221.4	1030.6	483.6	282.1	110.0	126.5	70.0	21.4	10.9	28.9					9635.2

Table IV (cont'd)
Record of Anchovy Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	2.50	3.75	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	Dis.	Total
Cruise 5609:																				
110.35							5.4							5.4						10.8
113.30	95.2	9.8						2.4												107.4
.40								2.5												2.5
115.27	48.7							4.1	4.1											56.9
.30	7.9		7.9	15.8			7.9		15.8											55.3
.35					11.2				5.6											16.8
.40		5.6							5.6					5.6						16.8
117.26	5.1									1.7										6.8
.35			17.6	5.0																22.6
.40			3.3																	3.3
118.25													5.8							5.8
123.37				11.1	5.5	22.1	5.5	11.0	5.5											60.7
127.34	2.8																			2.8
130.30								2.2		2.2										4.4
Total	159.7	15.4	28.8	31.9	16.7	22.1	18.8	22.2	36.6	3.9			5.8	11.0						372.9
Cruise 5610:																				
80.55		5.9		8.8	5.9	8.8	2.9		2.9											35.2
82.47	5.7	5.7	5.7			5.7				5.7										28.5
83.40	42.6	95.4	26.4	10.2	4.1	4.0	2.0	2.0												186.7
.43		11.4	17.1	8.5	2.8			2.8												42.6
.51		2.9	14.3	8.6	2.9	17.2	8.6	5.7												60.2
.55			22.1	16.6	60.9	11.0	16.6	16.6	11.0											154.8
.60					11.8	5.9	5.9													23.6
87.45							6.1													6.1
.50				5.8		20.2	11.6	11.6	5.8											55.0
.55				6.8		6.8	20.4		6.8			6.8								47.6
.60								6.8												6.8
90.28	9.6	6.4	12.8	12.8	9.6	3.2	12.8		3.2	3.2										73.6
.30						2.8					2.8		2.8							8.4
93.27	19.5	6.5	6.5	19.5			6.5													58.5
.30			3.2																	3.2
.35							24.3													24.3
97.40											3.3									3.3
.45																		6.1		6.1
Total	77.4	134.2	108.1	97.6	98.0	85.6	117.7	45.5	29.7	8.9	6.1	6.8	2.8					6.1		824.5

Table IV (cont'd)
Record of Anchovy Larvae, 1956

Station	Midpoint of Size Class (in mm.)																		
	2.50	3.75	4.75	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75	17.25	19.25	21.25	23.25	Dis.	Total
Cruise 5611:																				
82.47			6.2	33.9	33.9	52.4	43.1	21.5	12.3	3.1		3.1								209.5
83.43		12.2	24.3	30.4	36.5	18.2	42.5	24.4	30.4	18.3										237.2
.51		3.3	33.2	79.7	66.4	53.1	39.8	39.8	29.9	39.8	16.6	19.9	3.3	3.3						428.1
.55															3.0					3.0
.60					2.9				5.8											8.7
87.36	97.6	43.4	59.6	38.0	10.8	16.3	16.2		5.4											287.3
.50		2.7	2.7					2.7												8.1
.55		13.0	12.9		6.5	12.9	19.4	19.4												84.1
.60															3.0					3.0
90.28		17.3	26.0	26.0	17.4	5.8	8.7	8.7		2.9										112.8
.30													9.6							9.6
93.27			1.8	3.6	14.4	7.2	5.4													32.4
Total	97.6	91.9	166.7	211.6	188.8	165.9	175.1	116.5	83.8	64.1	16.6	23.0	12.9	3.3	6.0					1423.8
Cruise 5612:																				
80.51		8.2		2.7				2.7												13.6
.70												6.4								6.4
83.43		3.1																		3.1
.60							12.3													12.3
87.36	3.1																			3.1
.40						24.2														24.2
.45					6.1	12.2	24.4	12.2												54.9
.50					2.7															2.7
90.28		19.1	59.4	27.6	8.4	2.1	2.1	2.1												120.8
.30			2.8																	2.8
93.27	8.2	11.0			2.7															21.9
97.32			8.6			2.9														11.5
Total	11.3	41.4	70.8	30.3	19.9	41.4	38.8	17.0				6.4								277.3

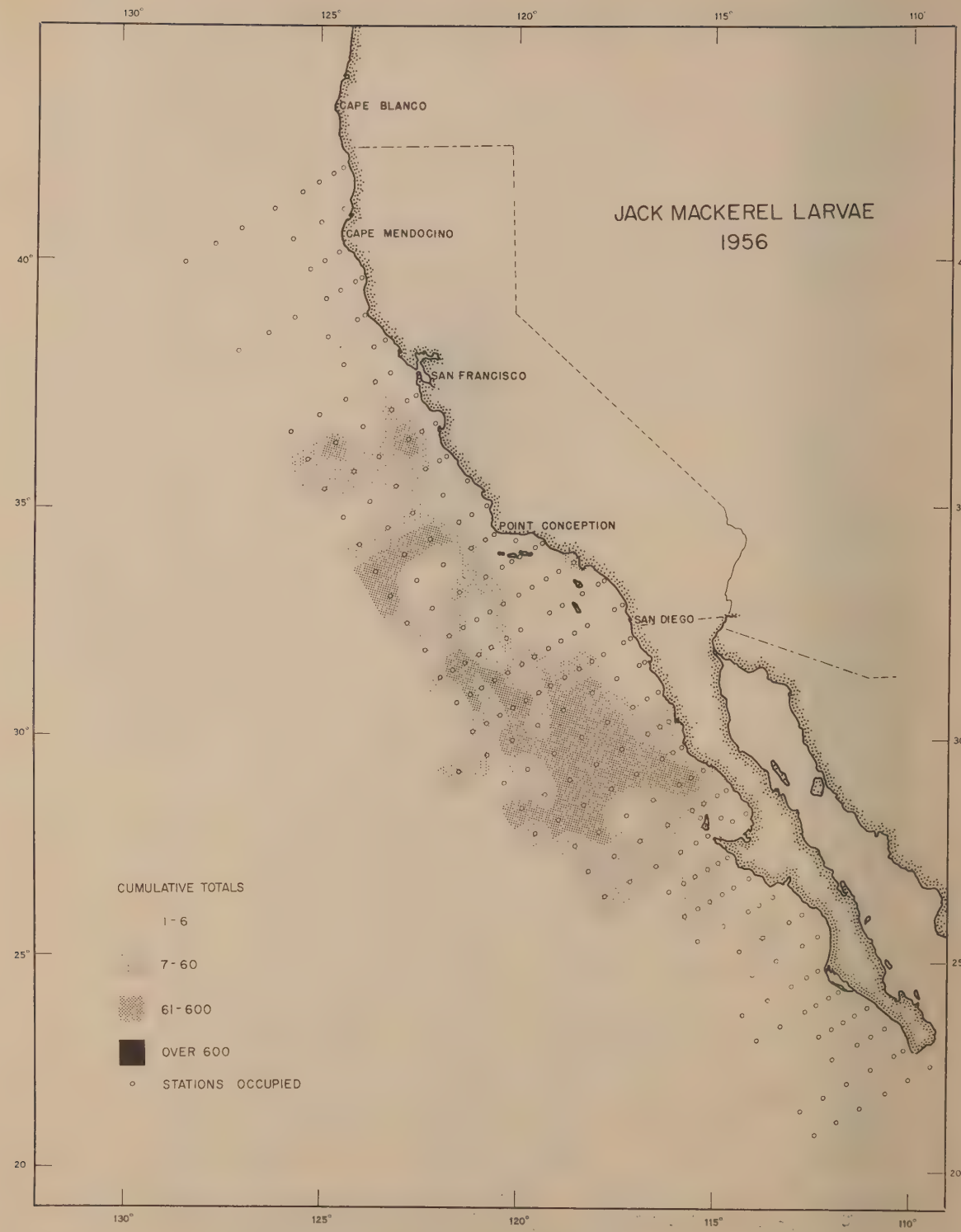

Figure 5.--Jack mackerel larvae, 1956: Distribution and relative abundance

RECORD OF THE LARVAE OF THE JACK MACKEREL (TRACHURUS SYMMETRICUS), 1956

The distribution and relative abundance of jack mackerel larvae in 1956 are shown in figure 5. The four categories of abundance are identical to those described for sardine larvae; individual station values represent the cumulative standard haul total for the year. The data presented in table V are summarized in text table 6, by month and area. The larvae of jack mackerel were described by Ahlstrom and Ball (1954). As in 1955, there were no occurrences off southern Baja California (lines 140-157), and only a few larvae (0.82%) were taken off lower central Baja California (lines 123-137). The area of greatest concentration of larvae differed in the two years: In 1956, the largest concentration (44.3%) occurred off northern Baja California (lines 97-107), while in 1955, most larvae (43.2%) were taken off southern California (lines 80-93).

Jack mackerel larvae are recorded by size classes in table V. These have the following midpoints and ranges:

Midpoint (in mm.)	Range (in mm.)	Midpoint (in mm.)	Range (in mm.)
2.00	1.76-2.25	7.75	7.26-8.25
2.50	2.26-2.75	8.75	8.26-9.25
3.00	2.76-3.25	9.75	9.26-10.25
3.50	3.26-3.75	10.75	10.26-11.25
4.00	3.76-4.25	11.75	11.26-12.25
4.50	4.26-4.75	12.75	12.26-13.25
5.00	4.76-5.25	13.75	13.26-14.25
5.75	5.26-6.25	14.75	14.26-15.25
6.75	6.26-7.25	15.26 and over	

The standard haul values of jack mackerel larvae for 1956 are compared with those for 1952 through 1955 in text tables 7 and 8. In the former, a summary is given by month; in the latter, by size. The data for the several years are only roughly comparable, since the coverage was somewhat different in each year.

The seasonal distribution of jack mackerel larvae is unusual in 1956. The greatest abundance of larvae occurred in March, with a secondary peak in June. In the neighboring years, larvae were only moderately abundant in March, and the peak month was either June (1953-55) or July (1952).

The abundance of larvae by size category is unusual in the paucity of small larvae, particularly 2.0 and 2.5 mm. larvae. It is interesting to note the similarity in abundance of larvae 4.0-5.75 mm. in length during the past three seasons.

Text table 6.--Occurrence and abundance (standard haul totals) of jack mackerel larvae (Trachurus symmetricus), by month and area, in hauls made during 1956

Cruise	Northern and central California 40-77		Southern California 80-93		Northern Baja California 97-107		Upper central Baja California 110-120		Lower central Baja California 123-137		Southern Baja California 140-157		Total	
	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber
5601	-	-	0	0	0	0	0	0	0	0	0	0	0	0
5602	-	-	0	0	3	50	12	483	0	0	0	0	15	533
5603	-	-	1	3	24	1,513	23	1,331	2	13	-	-	50	2,860
5604	0	0	4	23	9	68	12	179	4	32	0	0	29	302
5605	0	0	4	81	25	719	11	149	0	0	-	-	40	949
5606	1	24	20	929	13	1,136	6	89	1	8	-	-	41	2,186
5607	19	898	10	162	7	70	2	6	1	13	-	-	39	1,149
5608	-	-	-	-	-	-	1	48	0	0	-	-	1	48
5609	-	-	-	-	-	-	0	0	0	0	-	-	0	0
5610	-	-	0	0	0	0	-	-	-	-	-	-	0	0
5611	-	-	0	0	0	0	-	-	-	-	-	-	0	0
5612	-	-	0	0	0	0	-	-	-	-	-	-	0	0
Total	20	922	39	1,198	81	3,556	67	2,285	8	66	0	0	215	8,027
Percent		11.5		14.9		44.3		28.5		0.8		0		100.0

Text table 7.--Monthly abundance of jack mackerel larvae 1952-56, based on standard haul summations

	1952	1953	1954	1955	1956
January	2	0	30	0	0
February	14	251	197	618	533
March	1,224	931	1,042	1,075	2,860
April	3,709	923	1,915	3,393	302
May	5,410	1,497	5,108	1,063	949
June	4,737	3,582	6,203	5,385	2,186
July	6,029	582	302	1,705	1,149
August	537	37	111	Norpac	48
September	268	3	-	0	0
October	8	129	32	2	0
November	0	0	-	0	0
December	-	0	0	0	0
Total	21,938	7,935	14,940	13,241	8,027

Text table 8.--Abundance of jack mackerel larvae by size categories, 1952-56, based on standard haul summations

Size in mm.	1952	1953	1954	1955	1956
2.00	1,653	1,005	1,603	791	333
2.50	3.351	1,646	4,126	1,797	805
3.00	4,799	1,614	3,690	3,026	1,662
3.50	4,043	842	2,040	2,803	1,486
4.00	3,009	679	1,184	1,509	1,225
4.50	1,937	567	672	869	962
5.00	1,332	445	685	750	560
5.75	1,146	506	524	964	601
6.75	337	335	271	436	211
7.75	141	124	91	160	97
8.75	53	51	26	52	19
9.75	37	37	12	46	18
10.75	15	7	6	15	9
11.75	6	18	0	8	15
12.75	3	11	2	12	0
13.75	6	6	0	0	0
14.75	5	8	3	0	4
15.26 and over	17	33	6	5	20
Unclassified	49	0	0	0	0
Total	21,939	7,934	14,941	13,243	8,027

Table V
Record of the Larvae of Jack Mackerel (Trachurus symmetricus), 1956

Station	Midpoint of Size Class (in mm.)																		
	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.26 and over	Dis.	Total
Cruise 5602:																				
100.80			24.5																	24.5
103.60			22.6																	22.6
107.40			3.0																	3.0
110.40		3.2	6.5	9.7	3.2															22.6
.50	70.6	47.0	47.0																	164.6
.60	11.4	14.2	51.1	25.6	5.7															108.0
.70		3.1	18.7	21.8	6.2															49.8
.80	3.2																			3.2
113.35		5.6																		5.6
.40		2.9	20.1	8.6	2.9															34.5
.70		2.9	2.9	14.6	2.9															23.3
117.50			6.4																	6.4
.60		4.9	22.0	7.4	2.4															36.7
.70		7.5	18.8																	26.3
120.70																			2.1	2.1
Total	85.2	91.3	243.6	87.7	23.3														2.1	533.2
Cruise 5603:																				
93.70							2.8													2.8
97.80					2.8	2.8		2.8												8.4
.90					2.7	2.7			2.7											8.1
100.50			18.1	24.2	15.1	6.0														63.4
.70				5.6	11.2	5.6	5.6													28.0
.80			3.0	8.9	14.8	5.9	5.9													38.5
B100.90		3.0	3.0	6.0		6.0	6.0													24.0
S100.90	6.1		6.1	6.1																18.3
103.40			12.3																	12.3
B103.50			5.9	8.8	11.8					2.9										29.4
S103.50					19.3	19.3	6.4													45.0
B103.60			60.0	120.0	60.0	60.0														300.0
S103.60					90.0	30.0		30.0												150.0
B103.70		9.0	47.8	26.9	20.9	6.0	9.0	3.0	3.0											125.6
S103.70			3.4	27.2	68.0	30.6	20.4	6.8												156.4
B103.80			6.6	3.3	3.3															13.2
S103.80	3.9	15.5	19.4	27.1	15.5	7.7														89.1

Table V (cont'd)
Record of the Larvae of Jack Mackerel (Trachurus symmetricus), 1956

Station	Midpoint of Size Class (in mm.)																		
	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.26 and over	Dis.	Total
Cruise 5603 (cont'd)																				
B103.90						3.0														3.0
S103.90					3.5															3.5
107.32					3.3	6.6	3.3	9.9	3.3											26.4
.35														8.4						8.4
.50		3.3	6.6	9.9	9.9	56.1	26.4	13.2												125.4
.60			3.2	3.2	9.7	25.8	12.9	12.9	3.2											70.9
.70		3.5	42.5	92.0	14.2															152.2
.90			9.8	6.6																16.4
110.35			2.8			2.8		5.6	11.3	2.8										25.3
.40			6.5	26.1	55.4	42.4	22.8	6.6		3.3										163.1
.60						5.6														5.6
.70			5.7	5.7	5.7			5.7												22.8
.80		12.2	54.7	158.1	73.0	24.3	6.1	6.0												334.4
.90		5.1	25.7																	30.8
113.30						4.3		2.2	2.2											8.7
.35					11.6	11.6	11.6	11.6	11.6											58.0
.40			28.2		56.3	98.6	70.4	84.5		14.1										352.1
.45					3.2	6.4	22.5	90.1	16.1	3.2										141.5
.50					3.0	6.0	3.0	15.0												27.0
.55		4.4	4.4				4.4			4.4										17.6
.70			7.3	7.3					3.7											18.3
117.35		42.6																		42.6
.40						5.0		5.0												10.0
.45							3.2													3.2
.55					13.6	13.6														27.2
.70						3.3	3.3	3.3												9.9
.80									3.5											3.5
120.40	4.7																			4.7
.55			3.0																	3.0
.60		10.9						3.6												14.5
.70			2.9	2.9																5.8
123.50									6.1											6.1
.55			3.4	3.4																6.8
Total	14.7	109.5	392.3	579.3	597.8	498.0	246.0	317.8	66.7	30.7				8.4						2861.2

Table V (cont'd)
Record of the Larvae of Jack Mackerel (Trachurus symmetricus), 1956

Station	Midpoint of Size Class (in mm.)																		
	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.26 and over	Dis.	Total
Cruise 5604:																				
80.90									7.3											7.3
83.70									4.0											4.0
.90					3.1								3.1							6.2
87.90													2.9	2.9						5.8
97.50																	3.6			3.6
100.50														3.3						3.3
.60	3.4																			3.4
.80		3.7																		3.7
103.40		10.0	16.7																	26.7
.60		6.8																		6.8
107.40	3.3	3.3																		6.6
.60		4.9						4.9												9.8
.90									3.0											3.0
110.35		3.0																		3.0
.40												11.2								11.2
.60		20.9																		20.9
113.40		4.9	21.9	4.9	9.7															41.4
.50		14.8	7.4																	22.2
.80										4.4										4.4
117.35											5.2									5.2
.40			2.7																	2.7
.50				2.2	2.2															4.4
.80							3.0													3.0
120.70			10.4	15.6	2.6						2.6									31.2
.80			11.2	5.6	14.0															30.8
123.40		2.4					2.4	2.4												7.2
.42				2.1		2.1														4.2
127.50	5.5	5.5																		11.0
.60			3.3	3.3		3.3														9.9
Total	12.2	80.2	73.6	33.7	31.6	5.4	5.4	7.3	14.3	4.4	7.8	11.2	6.0	6.2			3.6			302.9

Table V (cont'd)
Record of the Larvae of Jack Mackerel (Trachurus symmetricus), 1956

Station	Midpoint of Size Class (in mm.)																		
	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.26 and over	Dis.	Total
Cruise 5605:																				
93.70	11.2		11.2																	22.4
.75	6.8	13.5																		20.3
.80	6.2																			6.2
.85	3.0	11.9	8.9	8.9																32.7
97.45		3.8	7.7	3.8	3.8	3.8														22.9
.55	7.7	3.8																		11.5
.60						12.8														12.8
.65				10.5																10.5
.80			12.1																	12.1
.90		12.5																		12.5
.95		12.7																		12.7
100.60		6.1	18.2	18.2	6.1	6.1														54.7
.85			13.0																	13.0
.90	2.6	5.3	2.6																	10.5
.95			4.0						4.0											8.0
.100		8.9		8.9		8.9		17.8												44.5
103.40							3.0			6.0										9.0
.45	5.8	17.5	78.8	40.9	32.1	29.2	26.3	11.7												242.3
.50			12.5			3.1	53.2	31.3												100.1
.55						3.2		6.3												9.5
.60		3.1	3.1																	6.2
.95											2.4									2.4
107.50						10.9														10.9
.55								12.0												12.0
.65			15.8	5.3																21.1
.75				11.4																11.4
.80					5.4															5.4
.85		5.9																		5.9
.90			9.8	19.6	9.8				9.8	9.8										58.8
110.50			9.5																	9.5
.55			24.8																	24.8
.75									6.0											6.0
.80			10.7				10.7													21.4
.85			4.7	4.7	9.4															18.8
.90		5.0	5.0		5.0															15.0

Table V (cont'd)
Record of the Larvae of Jack Mackerel (Trachurus symmetricus), 1956

Station	Midpoint of Size Class (in mm.)																		
	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.26 and over	Dis.	Total
Cruise 5605 (cont'd):																				
113.40			5.6																	5.6
.70																		20.2*		20.2
.80		8.0																		8.0
117.80				7.9																7.9
120.80			5.4	5.4																10.8
Total	43.3	118.0	263.4	145.5	71.6	78.0	93.2	79.1	19.8	15.8	2.4							20.2		950.3
* - 27.0 mm.																				
Cruise 5606:																				
77.70			11.9	11.9																23.8
80.90	5.3	31.9	47.9	10.6	10.6	10.6														116.9
83.70		5.7	17.0																	22.7
.80			4.7																	4.7
.90				2.9				2.9												5.8
87.60			11.5	5.7			5.7	5.7	5.7											34.3
.80		8.3	25.0	11.1	8.3			2.8												55.5
90.65			10.8																	10.8
.75a		9.6																		9.6
.75b			3.0	3.0																6.0
.80a		20.8	72.9	90.2	34.7	20.8	13.9	7.0												260.3
.80b									5.5											5.5
.85			21.0	26.2	13.1	5.2							2.6							68.1
.90						5.9		5.9			5.9									17.7
93.50	5.7																			5.7
.55		3.8																		3.8
.60	5.7	11.4	5.7																	22.8
.65	17.1		17.1																	34.2
.75	14.0	70.2	4.7	4.7																93.6
.80	12.5	12.5	12.5																	37.5
.85		20.8	27.7	13.8	27.7	13.8			6.9											110.7
97.50		3.0					3.0	6.0	3.0											15.0
.60	69.7	123.0	61.5	26.6	36.9	28.7	16.4	18.5	8.2											389.5
.65						20.0														20.0

Table V (cont'd)
Record of the Larvae of Jack Mackerel (Trachurus symmetricus), 1956

Station	Midpoint of Size Class (in mm.)																		
	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.26 and over	Dis.	Total
Cruise 5606 (cont'd):																				
97.70			20.6	61.9	89.4	103.2	34.4	6.9												316.4
.75	4.2	4.2	21.0	54.6	29.4	29.4	4.2	4.2	4.2	4.2		4.2								163.8
.80		3.5	10.6		10.6	3.5														28.2
.90				6.4																6.4
100.65	9.4			18.7	28.1			28.1	28.1											112.4
107.50			6.6																	6.6
.55										29.5										29.5
.65		3.7																		3.7
.80				6.4				12.8												19.2
.85						25.3														25.3
110.40			27.1																	27.1
.45	14.9																			14.9
113.45				9.1																9.1
117.65		13.5			13.5															27.0
120.50			3.7																	3.7
.60			6.8																	6.8
123.42							8.2													8.2
Total	158.5	345.9	451.3	363.8	302.3	266.4	85.8	100.8	61.6	33.7	5.9	4.2	2.6							2182.8
Cruise 5607:																				
60.60						5.4														5.4
63.60				23.4	23.4															46.8
.80			13.3	26.6	33.3	6.7		13.4												93.3
.90			23.5			5.9														29.4
67.55			21.6	10.8																32.4
.60			68.6	68.6	54.9	27.4	13.7	20.6	6.9											260.7
.70					6.6		19.9	6.6												33.1
.80						12.4														12.4
.90										12.4										12.4
70.60			12.6	25.1		6.3														44.0
.70						10.4		10.4	10.4											31.2
.80					5.4															5.4

Table V (cont'd)
Record of the Larvae of Jack Mackerel (Trachurus symmetricus), 1956

Station	Midpoint of Size Class (in mm.)																		
	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.26 and over	Dis.	Total
Cruise 5607 (cont'd):																				
73.70			7.4	14.9	22.4	7.5														52.2
.80			7.1			7.1	14.2	7.1												35.5
.90				6.8																6.8
77.60									6.2											6.2
.70					6.1	18.3	12.2		6.1											42.7
.80			6.8	27.0	20.3	6.8	6.8	6.8	6.8											81.3
.90					13.8		55.0													68.8
80.55				3.0			3.0													6.0
.60							5.2	15.5												20.7
83.48				2.6																2.6
.60		5.7	17.0																	22.7
.70				12.7																12.7
87.36			5.2	2.6																7.8
.65					3.2															3.2
.75		6.1	12.2	18.2	9.1			3.0			3.0									51.6
90.70		6.2																		6.2
93.70	13.6			13.6																27.2
97.85									12.3											12.3
.90		11.7																		11.7
100.60			8.5																	8.5
107.50	5.1	5.1																		10.2
.55		9.0		9.0																18.0
.70			6.9																	6.9
.80			2.7																	2.7
120.50												3.1								3.1
.55		2.8																		2.8
133.40								12.6												12.6
Total	18.7	46.6	213.4	264.9	198.5	114.2	130.0	96.0	48.7	12.4	3.0	3.1								1149.5
Cruise 5608:																				
118.35		13.4	13.4																	26.8
120.25			10.6	10.6																21.2
Total		13.4	24.0	10.6																48.0

RECORD OF THE LARVAE OF THE PACIFIC MACKEREL (PNEUMATOPHORUS DIEGO), 1956

Pacific mackerel larvae are reported by size in table VI. The size classes are identical to those used for jack mackerel (cf. p. 51). The data are further summarized in text table 9. The distribution and abundance of Pacific mackerel larvae in 1956 are shown in figure 6. The categories of abundance, given in an insert on the chart, are identical to those used in other charts in this report. The values at individual stations represent the cumulative standard haul total for all occupancies during 1956.

Pacific mackerel larvae constituted only 0.37% of the larvae collected in the regular CCOFI survey area in 1956. Larvae of this species were much more abundant in collections made in the Gulf of California. As noted earlier, the Gulf results will be reported in a separate publication.

On the outer coast, Pacific mackerel larvae were taken between Dana Point, off southern California, and Magdalena Bay, off southern Baja California (lines 90-143). There were only three occurrences off California (in June and July). The largest numbers of larvae were obtained off upper central Baja California (lines 110-120), especially in Sebastian Viscaino Bay. Most of the larvae were collected during a five-month period, April through August.

Pacific mackerel larvae were not taken over as wide an area in 1956 as in 1955. This is quite evident by comparing the distribution charts for the two years (fig. 6 in this report, with fig. 6 on p. 68 of Ahlstrom and Kramer, 1956). Pacific mackerel larvae were taken in only 40 hauls in 1956, as compared to 92 hauls in 1955. The 40 occurrences in 1956 were taken at 32 separate stations, while the 92 occurrences in 1955 were taken at 68 separate stations. These data are summarized in the following tabulation:

	1956			1955		
Lines	occurrences	stations	larvae	occurrences	stations	larvae
60-77	0	0	0	0	0	0
80-93	3	3	23	7	7	136
97-107	11	11	365	20	18	152
110-120	21	13	1,090	40	26	1,218
123-137	4	4	38	19	12	289
140-157	1	1	3	6	5	155
Total	40	32	1,519	92	68	1,950

It is interesting to note that the stations at which Pacific mackerel larvae were taken on more than one cruise in 1956 were all within Sebastian Viscaino Bay. In contrast, most multiple occurrences in 1955 were offshore from Cedros Island on lines 117 to 123.

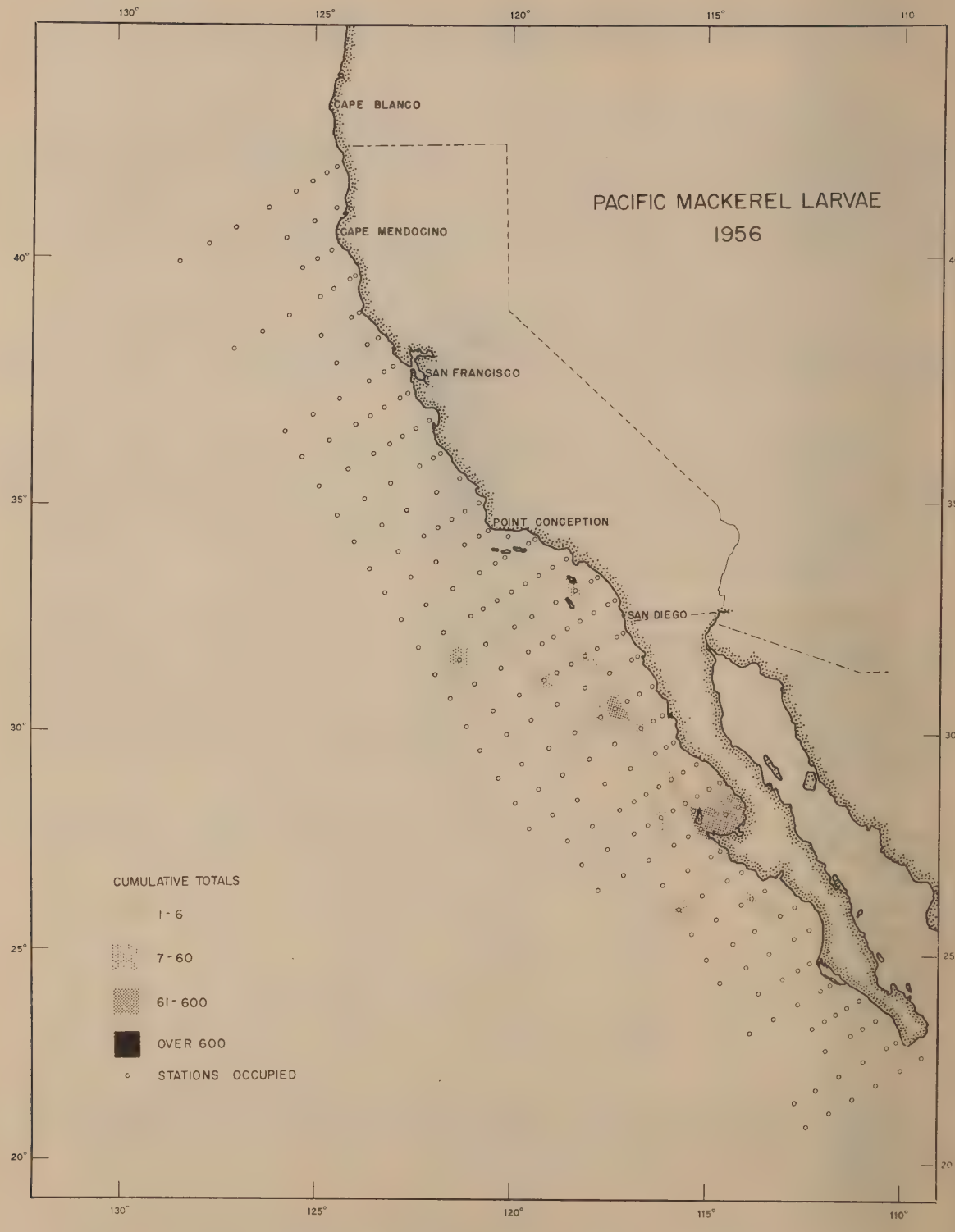

Figure 6.--Pacific mackerel larvae, 1956: Distribution and relative abundance

Text table 9.--Occurrence and abundance (standard haul totals) of Pacific mackerel larvae (*Pneumatophorus diego*), by month and area, in hauls made during 1956

Cruise	Northern and central California 40-77		Southern California 80-93		Northern Baja California 97-107		Upper central Baja California 110-120		Lower central Baja California 123-137		Southern Baja California 140-157		Total	
	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber
5601	-	-	0	0	1	8	0	0	0	0	1	3	2	11
5602	-	-	0	0	0	0	0	0	0	0	0	0	0	0
5603	-	-	0	0	1	4	0	0	0	0	-	-	1	4
5604	0	0	0	0	0	0	5	41	0	0	0	0	5	41
5605	0	0	0	0	7	325	3	83	0	0	-	-	10	408
5606	0	0	1	7	2	28	3	55	1	15	-	-	7	105
5607	0	0	2	16	0	0	5	306	2	12	-	-	9	334
5608	-	-	-	-	-	-	5	605	0	0	-	-	5	605
5609	-	-	-	-	-	-	0	0	1	11	-	-	1	11
5610	-	-	0	0	0	0	-	-	-	-	-	-	0	0
5611	-	-	0	0	0	0	-	-	-	-	-	-	0	0
5612	-	-	0	0	0	0	-	-	-	-	-	-	0	0
Total	0	0	3	23	11	365	21	1,090	4	38	1	3	40	1,519
Percent		0		1.5		24.0		71.8		2.5		0.2		100.0

Table VI
Record of the Larvae of Pacific Mackerel (Pneumatophorus diego), 1956

Station	Midpoint of Size Class (in mm.)																		
	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.26 and over	Dis.	Total
Cruise 5601:																				
107.40				8.4																8.4
143.26		1.4	1.4																	2.8
Total		1.4	1.4	8.4																11.2
Cruise 5603:																				
107.70					3.5															3.5
Total					3.5															3.5
Cruise 5604:																				
113.40			4.9			2.4														7.3
117.40		5.3	13.3																	18.6
.50		2.2	4.5	2.2																8.9
.80		3.0																		3.0
120.50			3.1																	3.1
Total		10.5	25.8	2.2		2.4														40.9
Cruise 5605:																				
97.45				3.8				3.8												7.6
.55			3.8																	3.8
100.40								5.5												5.5
103.40											3.0		3.0							6.0
.45		17.5	81.8	73.0	5.8	29.2	23.4	17.5												248.2
.50			6.3	6.3	6.3	6.3	9.4		3.1	6.2	6.2									50.1
.60				3.1																3.1
117.30		35.4																		35.4
118.39	20.5																			20.5
120.30		14.2	14.2																	28.4
Total	20.5	67.1	106.1	86.2	12.1	35.5	32.8	26.8	3.1	6.2	9.2		3.0							408.6

Table VI (cont'd)
Record of the Larvae of Pacific Mackerel (Pneumatophorus diego), 1956

Station	Midpoint of Size Class (in mm.)																		
	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.75	6.75	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.26 and over	Dis.	Total
Cruise 5606:																				
90.80a				3.5	3.5															7.0
97.50			3.0																	3.0
.60		4.1	4.1	8.2	2.0	4.1		2.0												24.5
117.26					10.1															10.1
.30		10.2		10.2																20.4
120.40	16.7	8.4																		25.1
127.60		15.2																		15.2
Total	16.7	37.9	7.1	21.9	15.6	4.1		2.0												105.3
Cruise 5607:																				
90.37			12.6																	12.6
.55								2.6												2.6
117.26						6.9	6.9													13.8
.40		13.8																		13.8
118.39			53.0	105.9																158.9
120.25	45.3			22.6																67.9
.40				8.5	8.5				17.0	8.5	8.5									51.0
130.35								10.1												10.1
133.30					2.5															2.5
Total	45.3	13.8	65.6	137.0	11.0	6.9	6.9	12.7	17.0	8.5	8.5									333.2
Cruise 5608:																				
118.35	120.2	240.5	93.5	13.4																467.6
120.25		10.6				10.6														21.2
.30					57.8	28.9														86.7
.35				12.5	6.2			3.1												21.8
.40	2.2		4.5																	6.7
Total	122.4	251.1	98.0	25.9	64.0	39.5		3.1												604.0
Cruise 5609:																				
123.37								11.1												11.1
Total								11.1												11.1

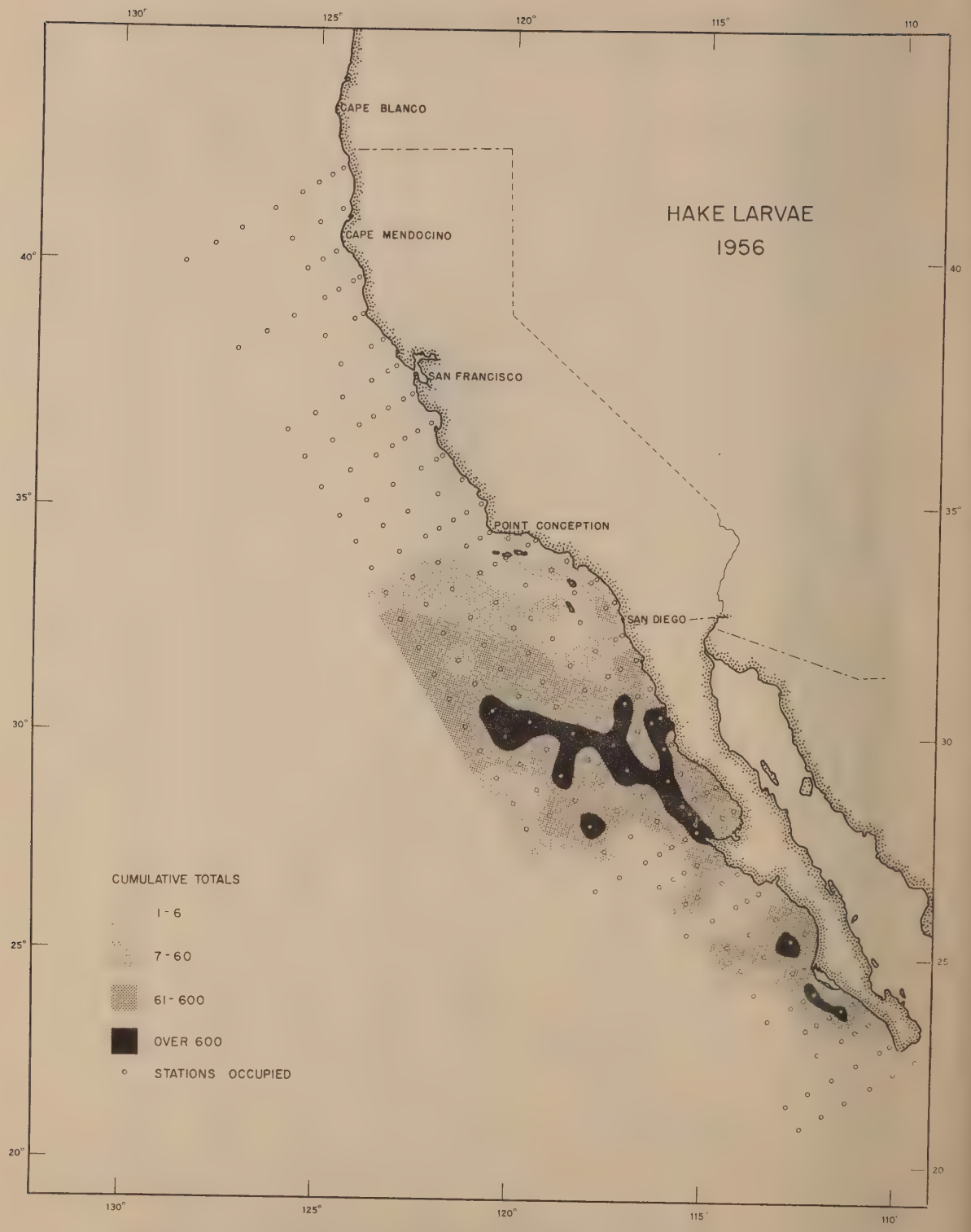

Figure 7.--Hake larvae, 1956: Distribution and relative abundance

RECORD OF THE LARVAE OF HAKE (MERLUCCIUS PRODUCTUS), 1956

Length measurements have not been made routinely on hake larvae, hence table VII contains only the standard haul total of larvae at each station where they occurred in 1956. The data are further summarized in text table 11 and illustrated in figure 7. The larvae of the Pacific hake have been described by Ahlstrom and Counts (1955).

The distribution of hake larvae in 1956 was basically similar to that found in 1955. There are two differences that should be noted: (1) the center of abundance occurred off northern Baja California in 1956 (lines 97-107), rather than off upper central Baja California (lines 110-120), and (2) the abundance off southern Baja California was proportionately greater (35.6% of the total, as compared to 21.2% in 1955).

Hake larvae ranked second in abundance in 1956, constituting 22.0% of the larvae collected. As in 1955, the greatest abundance occurred in February, and over 99% of the larvae were collected during the first four months of the year. A comparison of the monthly abundance of hake larvae in 1955 and 1956 is given in text table 10.

Text table 10.--Monthly abundance of hake larvae in 1955 and 1956 (standard haul totals)

	1955		1956	
	Standard haul total	Percent of total	Standard haul total	Percent of total
January	13,356	22.23	33,376	37.14
February	28,973	48.22	39,746	44.23
March	12,535	20.86	15,010*	16.70
April	4,757	7.92	1,047	1.17
May	176	0.29	301	0.33
June	19	0.03	195*	0.22
July	3	0.01	90	0.10
August	-	-	47	0.05
September	3	0.01	0	0
October	28	0.05	6	0.01
November	5	0.01	0	0
December	235	0.39	39	0.04
Total	60,090	100.02	89,857	99.99

* - Includes extra tows made in March and June

Text table 11.--Occurrence and abundance (standard haul totals), of hake larvae (Merluccius productus), by month and area, in hauls made during 1956

Cruise	Northern and central California 40-77		Southern California 80-93		Northern Baja California 97-107		Upper central Baja California 110-120		Lower central Baja California 123-137		Southern Baja California 140-157		Total	
	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber
5601	-	-	6	129	10	410	15	1,522	7	318	9	30,997	47	33,376
5602	-	-	7	52	18	28,913	24	8,409	12	1,475	13	897	74	39,746
5603	-	-	27	1,661	32	8,273	30	4,141	22	935	-	-	111	15,010*
5604	0	0	16	156	21	308	13	232	9	221	5	130	64	1,047
5605	0	0	8	42	17	167	1	25	6	67	-	-	32	301
5606	1	2	7	48	1	8	3	32	4	105	-	-	16	195*
5607	0	0	1	14	0	0	3	32	3	44	-	-	7	90
5608	-	-	-	-	-	-	3	47	0	0	-	-	3	47
5609	-	-	-	-	-	-	0	0	0	0	-	-	0	0
5610	-	-	1	6	0	0	-	-	-	-	-	-	1	6
5611	-	-	0	0	0	0	-	-	-	-	-	-	0	0
5612	-	-	5	39	0	0	-	-	-	-	-	-	5	39
Total	1	2	78	2,147	99	38,079	92	14,440	63	3,165	27	32,024	360	89,857
Percent		<0.01		2.4		42.4		16.1		3.5		35.6		100.0

* - Totals for March and June include the larvae taken in extra occupancies of stations made during these months

Table VII

Record of the Larvae of Hake (Merluccius productus), 1956

	Cruise and Month											
Sta.	5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
70.52[1]	-	-	-					-	-	-	-	-
.55	-	-	-					-	-	-	-	-
.60	-	-	-					-	-	-	-	-
.70	-	-	-					-	-	-	-	-
.80	-	-	-					-	-	-	-	-
.90	-	-	-			2		-	-	-	-	-
73.50	-	-	-					-	-	-	-	-
.60	-	-	-					-	-	-	-	-
.70	-	-	-					-	-	-	-	-
.80	-	-	-	-		-		-	-	-	-	-
.90	-	-	-	-	-	-		-	-	-	-	-
77.50	-	-	-					-	-	-	-	-
.55	-	-	-					-	-	-	-	-
.60	-	-	-	-				-	-	-	-	-
.65	-	-	-		-	-	-	-	-	-	-	-
.70	-	-	-	-				-	-	-	-	-
.80	-	-	-	-		-		-	-	-	-	-
.90	-	-	-	-	-	-		-	-	-	-	-
80.51			NS					-	-			
.55								-	-			6
.60		3			3			-	-			
.70			3		5			-	-			
.80			14	4		9		-	-			
.90			21	7				-	-			
82.47	-		3					-	-	6		3
83.40		NQ				NQ		-	-			-
.43	2					NQ		-	-			3
.48	-	-	-	-	-	-		-	-	-	-	-
.51			5					-	-			3
.55	-	-	-					-	-			
.60			12					-	-			
.70	-	-	27	16		11		-	-	-	-	-
.80	-	-	18	3		5		-	-	-	-	-
.90	-	-	13	55				-	-	-	-	-
87.36		13			2			-	-	-		
.40								-	-			24
.45	-	-	-	-				-	-			
.50		3						-	-			
.55	-	-	-	-				-	-			
.60			38					-	-			
.65	-	-	-	-	5	11		-	-	-	-	-

1/ No hake larvae were taken above line 70

Table VII (cont'd)
Record of the Larvae of Hake (Merluccius productus), 1956

	Cruise and Month											
Sta.	5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
87.70	-	-	47	7				-	-	-	-	-
.75	-	-	-	-	2	-		-	-	-	-	-
.80	-	-	99					-	-	-	-	-
.85	-	-	-	-	-	-		-	-	-	-	-
.90	-	-	287	9		-		-	-	-	-	-
90.28	26	11	5	4				-	-			
.30	24		12					-	-			
.37				3				-	-			
.45	25	6	6					-	-			
.50	-	-	-	-				-	-			
.55			24	9				-	-			
.60			48					-	-			
.65	-	-	-	-				-	-	-	-	-
.70			252	21				-	-		-	
.75	-	-	-	-		2*		-	-	-	-	-
.80			41		10	2*		-	-		-	
.85	-	-	-	-				-	-	-	-	-
.90	-	-	129					-	-		-	
.95	-	-	-	-		-	-	-	-	-	-	-
.100	-	-	-	-		-	-	-	-	-	-	-
93.27	5	2						-	-			
.30	47	14	4	3				-	-			
.35	-	-	-	-				-	-			
.40			3					-	-			
.45	-	-	-	-				-	-			
.50				4				-	-			
.55	-	-	-	-				-	-			
.60	-		87	3				-	-			
.65	-	-	-	-	-			-	-	-	-	-
.70	-		181				14	-	-	-	-	-
.75	-	-	-	-		5		-	-	-	-	-
.80	-	-	155	3	6			-	-	-	-	-
.85	-	-	-	-	9			-	-	-	-	-
.90	-	-	127	5				-	-	-	-	-
.95	-	-	-	-		-	-	-	-	-	-	-
.100	-	-	-	-		-	-	-	-	-	-	-
97.30	28		13					-	-			
.32			9					-	-			
.40		6		7	3			-	-			
.45	-	-	-	-		NS		-	-			
.50			12	7				-	-			
.55	-	-	-	-	4			-	-			
.60	-	34	32	6	13	8		-	-			

* - Extra tow taken

Table VII (cont'd)
Record of the Larvae of Hake (Merluccius productus), 1956

Sta.	Cruise and Month											
	5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
97.65	-	-	-	-				-	-	-	-	-
.70	-		569	8				-	-	-	-	-
.75	-	-	-	-				-	-	-	-	-
.80	-	-	690	4	12			-	-	-	-	-
.85	-	-	-	-				-	-	-	-	-
.90	-	-	58	128	25			-	-	-	-	-
.95	-	-	-	-		-	-	-	-	-	-	-
.100	-	-	-	-		-	-	-	-	-	-	-
100.29	50	114	42					-	-	-	-	-
.30	6	-	-	-	3	-		-	-	-	-	-
.33	-	73	27	3	-		-	-	-	-	-	-
.35	-	-	-	-				-	-	-	-	-
.40		2	21	3				-	-	-	-	-
.45	-	-	-	-				-	-	-	-	-
.50	36	7	220	17				-	-	-	-	-
.55	-	-	-	-		-		-	-	-	-	-
.60		16	79	10				-	-	-	-	-
.65	-	-	-	-				-	-	-	-	-
.70		660	146			-		-	-	-	-	-
.75	-	-	-	-		-		-	-	-	-	-
.80		25753	285	11	5	-		-	-	-	-	-
.85	-	-	-	-		-		-	-	-	-	-
.90	-	-	271*	45	16	-		-	-	-	-	-
.95	-	-	-	-	12	-	-	-	-	-	-	-
.100	-	-	-	-	18	-	-	-	-	-	-	-
103.30	3	17	30					-	-	-	-	-
.35		51	196					-	-	-	-	-
.40	17	288	499	7				-	-	-	-	-
.45	-	-	-	-		-		-	-	-	-	-
.50			164*	10	3	-		-	-	-	-	-
.55	-	-	-	-		-		-	-	-	-	-
.60		23	645*			-		-	-	-	-	-
.65	-	-	-	-		-		-	-	-	-	-
.70	-	-	310*	6		-		-	-	-	-	-
.75	-	-	-	-		-		-	-	-	-	-
.80	-	-	141*	6		-		-	-	-	-	-
.85	-	-	-	-		-		-	-	-	-	-
.90	-	-	18*		12	-		-	-	-	-	-
.95	-	-	-	-	2	-	-	-	-	-	-	-
.100	-	-	-	-	12	-	-	-	-	-	-	-
107.32	46	102	640	2				-	-	-	-	-
.35	62	563	605					-	-	-	-	-

Table VII (cont'd)
Record of the Larvae of Hake (Merluccius productus), 1956

Sta.	Cruise and Month 5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
107.40	143	114	124					-	-	-	-	-
.45	-	-	-	-				-	-	-	-	-
.50	19	906	116	2				-	-	-	-	-
.55	-	-	-	-				-	-	-	-	-
.60		184	149	5				-	-	-	-	-
.65	-	-	-	-			-	-	-	-	-	-
.70	-	-	605					-	-	-	-	-
.75	-	-	-	-			-	-	-	-	-	-
.80	-	-		18	11			-	-	-	-	-
.85	-	-	-	-	6		-	-	-	-	-	-
.90	-	-	10	3	10			-	-	-	-	-
110.33	212	39	32				9	16		-	-	-
.35	142	109	296	95			9			-	-	-
.40	8	255	248	22						-	-	-
.45	-	-	-	-				-	-	-	-	-
.50		612	296					-	-	-	-	-
.55	-	-	-	-				-	-	-	-	-
.60		11	229					-	-	-	-	-
.65	-	-	-	-			-	-	-	-	-	-
.70		53	166	2				-	-	-	-	-
.75	-	-	-	-			-	-	-	-	-	-
.80		6	76					-	-	-	-	-
.85	-	-	-	-			-	-	-	-	-	-
.90	-	-	10					-	-	-	-	-
113.30	NS	144	26							-	-	-
.35	4	189	151							-	-	-
.40		1966	310							-	-	-
.45	-	-	225	-				-	-	-	-	-
.50	50	281	78					-	-	-	-	-
.55	-	-	57	-				-	-	-	-	-
.60		58	205	11				-	-	-	-	-
.65	-	-	-	-			-	-	-	-	-	-
.70		639	11					-	-	-	-	-
.75	-	-	-	-			-	-	-	-	-	-
.80	-	-	11					-	-	-	-	-
115.27	-	-	-	-	-	-	-	24		-	-	-
.30	-	-	-	-	-	-	-			-	-	-
.35	-	-	-	-	-	-	-			-	-	-
.40	-	-	-	-	-	-	-			-	-	-
117.26	66	91	88	8		10	14	7		-	-	-
.30	6	16	106			10				-	-	-
.35	21	225	170	10						-	-	-

Table VII (cont'd)
Record of the Larvae of Hake (Merluccius productus), 1956

Sta.	Cruise and Month 5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
117.40	137	790	146							-	-	-
.45	-	-	96	-				-	-	-	-	-
.50	45	29	65					-	-	-	-	-
.55	-	-	312	-				-	-	-	-	-
.60		5						-	-	-	-	-
.65	-	-	-	-			-	-	-	-	-	-
.70				7				-	-	-	-	-
.75	-	-	-	-			-	-	-	-	-	-
.80	-	-		6				-	-	-	-	-
118.25	-	-	-	-	-	-	-			-	-	-
.30	-	-	-	-	-	-	-			-	-	-
.35	-	-	-	-	-	-	-			-	-	-
.39	673	767	113	NQ				-	-	-	-	-
119.33	3	5	170					-	-	-	-	-
120.25	80	10	271	11	25					-	-	-
.30	72		128	22		12				-	-	-
.35	-	-	-	-	-	-	-			-	-	-
.40		1799	33							-	-	-
.45		310	16	27						-	-	-
.50	3			9				-	-	-	-	-
.55				2				-	-	-	-	-
.60								-	-	-	-	-
.70								-	-	-	-	-
.80	-	-						-	-	-	-	-
123.37		48	26							-	-	-
.40	3	-	42	2	-		-	-	-	-	-	-
.42	-	130	-							-	-	-
.45	-	-	88	-	-	-	-			-	-	-
.50	NS		6					-	-	-	-	-
.55	3	NS	3	-				-	-	-	-	-
.60	-	-		5				-	-	-	-	-
127.34		6	3	15			NS			-	-	-
.40				36						-	-	-
.45	-	-	3	-						-	-	-
.50		59	18					-	-	-	-	-
.55	12	282	3	-				-	-	-	-	-
.60	-	-	3					-	-	-	-	-
130.30			2	7						-	-	-
.35				3		4	10			-	-	-
.40			3							-	-	-
.45	-	-	NQ	-	-	-	-			-	-	-
.50		3						-	-	-	-	-
.60	-							-	-	-	-	-

Table VII (cont'd)
Record of the Larvae of Hake (Merluccius productus), 1956

Sta.	Cruise and Month 5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
133.25	112	12	33	17	19					-	-	-
.30		342	40		4	12				-	-	-
.40		11	20					-	-	-	-	-
.50	-	-	80	-			3	-	-	-	-	-
.60	-	-	59	-	-	-	-	-	-	-	-	-
137.23	2	32	38	20	11	23				-	-	-
.30	181	289	366	116	20	66	31			-	-	-
.40	5	261	92		10			-	-	-	-	-
.50	-	-	7	-	3			-	-	-	-	-
.60	-	-		-	-	-	-	-	-	-	-	-
140.30		308	-	80	-	-	-	-	-	-	-	-
.35	50	136	-	18	-	-	-	-	-	-	-	-
.40	2	30	-	11	-	-	-	-	-	-	-	-
.50	-		-	-	-	-	-	-	-	-	-	-
.60	-		-	-	-	-	-	-	-	-	-	-
143.26		6	-	6	-	-	-	-	-	-	-	-
.30	29705	62	-	15	-	-	-	-	-	-	-	-
.35	247	10	-		-	-	-	-	-	-	-	-
.40	-		-		-	-	-	-	-	-	-	-
.50	-		-	-	-	-	-	-	-	-	-	-
.60	-		-	-	-	-	-	-	-	-	-	-
147.20	88	87	-		-	-	-	-	-	-	-	-
.25	887	81	-		-	-	-	-	-	-	-	-
.30	3	73	-		-	-	-	-	-	-	-	-
.35	-	56	-		-	-	-	-	-	-	-	-
.40	-	34	-		-	-	-	-	-	-	-	-
150.19		12	-		-	-	-	-	-	-	-	-
.25	12		-		-	-	-	-	-	-	-	-
.30	3		-		-	-	-	-	-	-	-	-
.40	-	2	-		-	-	-	-	-	-	-	-
153.16			-		-	-	-	-	-	-	-	-
.20			-		-	-	-	-	-	-	-	-
.30			-		-	-	-	-	-	-	-	-
.40	-		-		-	-	-	-	-	-	-	-
.50	-		-		-	-	-	-	-	-	-	-
.60	-		-		-	-	-	-	-	-	-	-
157.10		-	-	-	-	-	-	-	-	-	-	-
.20			-		-	-	-	-	-	-	-	-
.30			-		-	-	-	-	-	-	-	-
.40	-		-		-	-	-	-	-	-	-	-
.50	-		-		-	-	-	-	-	-	-	-
.60	-		-		-	-	-	-	-	-	-	-
Total	33376	39746	13463	1047	301	192	90	47	0	6	0	39

RECORD OF THE LARVAE OF ROCKFISH (SEBASTODES SPP.), 1956

Rockfish larvae belong to a single genus, Sebastodes, but to a number of species. Larvae of Sebastodes can be identified without difficulty, but no attempt has been made to determine the species composition included in this category. According to Phillips (1957) there are 49 species of rockfish that occur off California, and 34 of these are definitely known to occur off Baja California, as well.

Rockfish larvae were taken in greatest abundance off southern California (lines 80-93); 50.4% of all rockfish larvae collected in 1956 were taken in this area. The average number of larvae per haul, 37.3, was nearly twice as large as the average from any other area, as is shown in the following tabulation:

Station lines	Total samples taken	Occurrences of rockfish larvae	Percent occurrence	Total number of larvae taken	Percent taken in each area	Average number per haul
40-57	54	24	44.4	411	1.4	7.6
60-77	112	59	52.6	1,570	5.4	14.0
80-93	393	247	62.9	14,674	50.4	37.3
97-107	274	97	35.4	4,703	16.1	17.2
110-120	308	112	36.4	6,306	21.6	20.5
123-137	180	65	36.1	1,424	4.9	7.9
140-157	76	10	13.2	56	0.2	0.7
	1,397	614	43.9	29,144	100.0	20.8

Rockfish larvae were taken in greater abundance during the three-month period, January through March, than at other seasons. The monthly abundance off southern California (lines 80-93) is shown in the following tabulation:

Month	Total stations occupied	Number of larvae	Average number per haul
January	26	2,384	91.4
February	28	3,573	127.6
March	37	3,639	98.4
April	39	773	19.8
May	56	1,156	20.6
June	49	694	14.2
July	55	400	7.3
August	-	-	-
September	-	-	-
October	35	317	9.1
November	33	336	10.2
December	35	1,402	40.1
	393	14,674	37.3

Since stations were not occupied on lines 40-77 during January through March, rockfish larvae were not adequately sampled off northern and central California.

Text table 12.--Occurrence and abundance (standard haul totals) of rockfish larvae (Sebastodes spp.), by month and area, in hauls made during 1956

Cruise	Northern and central California 40-77		Southern California 80-93		Northern Baja California 97-107		Upper central Baja California 110-120		Lower central Baja California 123-137		Southern Baja California 140-157		Total	
	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber	occur-rences	num-ber
5601	-	-	18	2,384	14	1,369	15	375	4	156	2	9	53	4,293
5602	-	-	24	3,573	12	1,536	17	2,365	10	219	3	24	66	7,717
5603	-	-	35	3,639	19	950	26	1,408	12	407	-	-	92	6,404
5604	20	384	29	773	13	413	20	1,030	10	264	5	23	97	2,887
5605	16	364	31	1,156	13	145	15	542	9	79	-	-	84	2,286
5606	27	431	32	694	17	122	8	237	7	100	-	-	91	1,584
5607	20	802	21	400	5	136	4	59	5	92	-	-	55	1,489
5608	-	-	-	-	-	-	7	290	8	107	-	-	15	397
5609	-	-	-	-	-	-	0	0	0	0	-	-	0	0
5610	-	-	16	317	0	0	-	-	-	-	-	-	16	317
5611	-	-	17	336	1	22	-	-	-	-	-	-	18	358
5612	-	-	24	1,402	3	10	-	-	-	-	-	-	27	1,412
Total	83	1,981	247	14,674	97	4,703	112	6,306	65	1,424	10	56	614	29,144
Percent		6.8		50.4		16.1		21.6		4.9		0.2		100.0

Table VIII

Record of the Larvae of Rockfish (Sebastodes spp.), 1956

Sta.	Cruise and Month 5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
40.38	-	-	-	-			-	-	-	-	-	-
.40	-	-	-	-			-	-	-	-	-	-
.45	-	-	-	-	9	20	-	-	-	-	-	-
.50	-	-	-	-		32	-	-	-	-	-	-
.60	-	-	-	-	12	12	-	-	-	-	-	-
.70	-	-	-	-	18		-	-	-	-	-	-
.80	-	-	-	-			-	-	-	-	-	-
.90	-	-	-	-			-	-	-	-	-	-
43.42	-	-	-	-			-	-	-	-	-	-
.50	-	-	-	-		23	-	-	-	-	-	-
.60	-	-	-	-			-	-	-	-	-	-
47.50	-	-	-	-		7	-	-	-	-	-	-
.55	-	-	-	-			-	-	-	-	-	-
.60	-	-	-	-	13	15	-	-	-	-	-	-
50.47	-	-	-	-	26	10	-	-	-	-	-	-
.50	-	-	-	-		29	-	-	-	-	-	-
.55	-	-	-	-		6	-	-	-	-	-	-
.60	-	-	-	-		4	-	-	-	-	-	-
.70	-	-	-	-		12	-	-	-	-	-	-
.80	-	-	-	-	26		-	-	-	-	-	-
.90	-	-	-	-			-	-	-	-	-	-
53.52	-	-	-	-		13	-	-	-	-	-	-
.55	-	-	-	-	31	10	-	-	-	-	-	-
.65	-	-	-	-	44	22	-	-	-	-	-	-
57.51	-	-	-	-	3		-	-	-	-	-	-
.55	-	-	-	-		14	-	-	-	-	-	-
.65	-	-	-	-			-	-	-	-	-	-
60.50	-	-	-	17	-	-	-	-	-	-	-	-
.55	-	-	-	3	52			-	-	-	-	-
.57	-	-	-	3	-		-	-	-	-	-	-
.60	-	-	-		12	7	54	-	-	-	-	-
.70	-	-	-	18			20	-	-	-	-	-
.80	-	-	-		20			-	-	-	-	-
.90	-	-	-	14				-	-	-	-	-
63.52	-	-	-	5		14		-	-	-	-	-
.55	-	-	-			76		-	-	-	-	-
.60	-	-	-	-	-	-	12	-	-	-	-	-
.65	-	-	-		55	2	-	-	-	-	-	-
.70	-	-	-	-	-	-		-	-	-	-	-
.80	-	-	-	12	-	-	13	-	-	-	-	-
.90	-	-	-	-	-	-	12	-	-	-	-	-
67.50	-	-	-	25			96	-	-	-	-	-
.55	-	-	-	22			119	-	-	-	-	-

Table VIII (cont'd)
Record of the Larvae of Rockfish (Sebastodes spp.), 1956

Sta.	Cruise and Month 5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
67.60	-	-	-	-	-	-	41	-	-	-	-	-
.65	-	-	-	36	7	13	-	-	-	-	-	-
.70	-	-	-	-	-	-	13	-	-	-	-	-
.80	-	-	-	7	-	-		-	-	-	-	-
.90	-	-	-	-	-	-		-	-	-	-	-
70.52	-	-	-					-	-	-	-	-
.55	-	-	-	10		5	47	-	-	-	-	-
.60	-	-	-	11			31	-	-	-	-	-
.70	-	-	-			5	10	-	-	-	-	-
.80	-	-	-	54		16		-	-	-	-	-
.90	-	-	-	38		2		-	-	-	-	-
73.50	-	-	-	16			3	-	-	-	-	-
.60	-	-	-	14		3	18	-	-	-	-	-
.70	-	-	-					-	-	-	-	-
.80	-	-	-	-		-	7	-	-	-	-	-
.90	-	-	-	-	-	-		-	-	-	-	-
77.50	-	-	-	25	10		128	-	-	-	-	-
.55	-	-	-	48	26	46	107	-	-	-	-	-
.60	-	-	-	-		13	18	-	-	-	-	-
.65	-	-	-	6	-	-	-	-	-	-	-	-
.70	-	-	-	-			12	-	-	-	-	-
.80	-	-	-	-		-		-	-	-	-	-
.90	-	-	-	-	-	-	41	-	-	-	-	-
80.51	7	15	NS	16	6	24	18	-	-	2	3	11
.55	358		28	10	42		18	-	-	115	3	71
.60	125	13	191			16		-	-	18		227
.70	6	9	95	7		17	6	-	-		3	
.80		12	12					-	-			6
.90			9					-	-			
82.47	-	54	98	18	79	20	28	-	-	23	6	26
83.40	39	NQ	4	2	20	NQ		-	-			-
.43	136	252	475	12	61	NQ	30	-	-	11	49	6
.48	-	-	-	-	-	-	10	-	-	-	-	-
.51	254	20	278	66	160	188	47	-	-	46	123	174
.55	-	-	-	26	59	12		-	-	11	21	12
.60			316	7		2	17	-	-	12	43	12
.70	-	-	3	16		6		-	-	-	-	-
.80	-	-				2	11	-	-	-	-	-
.90	-	-	3					-	-	-	-	-
87.36	7	282	188	56	35	6	3	-	-	-	11	6
.40	57	479	198	86	18			-	-	18	3	121
.45	-	-	-	-	30	13	98	-	-			165
.50	439	980	119	157	22	118	15	-	-	26	30	452

Table VIII (cont'd)
Record of the Larvae of Rockfish (Sebastodes spp.), 1956

Sta.	Cruise and Month											
	5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
87.55	-	-	-	-		11	4	-	-	7	13	25
.60	85	23	38	38		6	12	-	-			
.65	-	-	-	-		32		-	-	-	-	-
.70	-	-	69	14	5			-	-	-	-	-
.75	-	-	-	-		-		-	-	-	-	-
.80	-	-	33	4				-	-	-	-	-
.85	-	-	-	-	-	-		-	-	-	-	-
.90	-	-				-		-	-	-	-	-
90.28	285	238	122	12				-	-	3	6	6
.30	191	34	88	12	6		12	-	-	3		
.37		285	57	40	32	6		-	-			
.45	175	98	253	52	233	19		-	-	6		12
.50	-	-	-	-	9	18		-	-			34
.55	107	131	506	35	87	54	5	-	-		4	
.60	40	37	32	24	50			-	-			
.65	-	-	-	-	2		23	-	-	-	-	-
.70		345	6		12	3		-	-		-	
.75	-	-	-	-		8*		-	-	-	-	-
.80			119		10	8*		-	-		-	3
.85	-	-	-	-				-	-	-	-	-
.90	-	-	55			6		-	-		-	
.95	-	-	-	-	3	-	-	-	-	-	-	-
.100	-	-	-	-		-	-	-	-	-	-	-
93.27	54	96	43	30			16	-	-	13	2	6
.30		112	25	3	3	3	12	-	-	3		6
.35	-	-	-	-		7	2	-	-			3
.40	19	22	121	7	8	19		-	-			6
.45	-	-	-	-	8	9		-	-		3	9
.50		11	25	4	78		13	-	-		13	3
.55	-	-	-	-	9			-	-			
.60	-	18	12	6	14			-	-			
.65	-	-	-	-	-	17		-	-	-	-	-
.70	-	7	8	7	22	20		-	-	-	-	-
.75	-	-	-	-	27	9		-	-	-	-	-
.80	-	-	7	6	6			-	-	-	-	-
.85	-	-	-	-				-	-	-	-	-
.90	-	-	3					-	-	-	-	-
.95	-	-	-	-		-	-	-	-	-	-	-
.100	-	-	-	-		-	-	-	-	-	-	-
97.30	57	46	52	65	10	15	19	-	-		22	4
.32		3	12	87	10	2		-	-			3
.40	24			4		4		-	-			
.45	-	-	-	-	4	NS	3	-	-			

Table VIII (cont'd)
Record of the Larvae of Rockfish (Sebastodes spp.), 1956

	Cruise and Month											
Sta.	5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
97.50		9				6		-	-			
.55	-	-	-	-		2		-	-			3
.60	-		18			14		-	-			
.65	-	-	-	-				-	-	-	-	-
.70	-	14	3	16		14		-	-	-	-	-
.75	-	-	-	-	13	4		-	-	-	-	-
.80	-	-	3					-	-	-	-	-
.85	-	-	-	-				-	-	-	-	-
.90	-	-						-	-	-	-	-
.95	-	-	-	-		-	-	-	-	-	-	-
.100	-	-	-	-		-	-	-	-	-	-	-
100.29	169	262	162	20	6	15	37	-	-	-	-	-
.30	58	-	-	-	16	-	69	-	-	-	-	-
.33	-	279	188	29	-	5	-	-	-	-	-	-
.35	-	-	-	-	6	11		-	-	-	-	-
.40	96	30	9	34	22			-	-	-	-	-
.45	-	-	-	-		2		-	-	-	-	-
.50	57			7				-	-	-	-	-
.55	-	-	-	-		-		-	-	-	-	-
.60	13					3		-	-	-	-	-
.65	-	-	-	-		9		-	-	-	-	-
.70			6			-		-	-	-	-	-
.75	-	-	-	-		-		-	-	-	-	-
.80			3			-		-	-	-	-	-
.85	-	-	-	-		-		-	-	-	-	-
.90	-	-	*			-		-	-	-	-	-
.95	-	-	-	-		-	-	-	-	-	-	-
.100	-	-	-	-		-	-	-	-	-	-	-
103.30	106	545	149	64				-	-	-	-	-
.35	29	32	23	55				-	-	-	-	-
.40	3	83	18		12			-	-	-	-	-
.45	-	-	-	-	3	-		-	-	-	-	-
.50			*			-		-	-	-	-	-
.55	-	-	-	-	3	-		-	-	-	-	-
.60			*	27	12	-		-	-	-	-	-
.65	-	-	-	-		-		-	-	-	-	-
.70	-	-	2*			-		-	-	-	-	-
.75	-	-	-	-		-		-	-	-	-	-
.80	-	-	*			-		-	-	-	-	-
.85	-	-	-	-		-		-	-	-	-	-
.90	-	-	*			-		-	-	-	-	-
.95	-	-	-	-		-	-	-	-	-	-	-
.100	-	-	-	-		-	-	-	-	-	-	-

Table VIII (cont'd)
Record of the Larvae of Rockfish (Sebastodes spp.), 1956

	Cruise and Month											
Sta.	5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
107.32	551	229	43		28	4	8	-	-	-	-	-
.35	146		101			6		-	-	-	-	-
.40	50		138	3				-	-	-	-	-
.45	-	-	-	-		6		-	-	-	-	-
.50	10		16	2				-	-	-	-	-
.55	-	-	-	-				-	-	-	-	-
.60		4	3					-	-	-	-	-
.65	-	-	-	-			-	-	-	-	-	-
.70	-	-						-	-	-	-	-
.75	-	-	-	-			-	-	-	-	-	-
.80	-	-						-	-	-	-	-
.85	-	-	-	-			-	-	-	-	-	-
.90	-	-						-	-	-	-	-
110.33	36	131	9	118	48			5		-	-	-
.35	83		51	54	15					-	-	-
.40	8		20	33						-	-	-
.45	-	-	-	-	10			-	-	-	-	-
.50	3		68	10				-	-	-	-	-
.55	-	-	-	-				-	-	-	-	-
.60			45					-	-	-	-	-
.65	-	-	-	-			-	-	-	-	-	-
.70			57	8				-	-	-	-	-
.75	-	-	-	-			-	-	-	-	-	-
.80			3					-	-	-	-	-
.85	-	-	-	-			-	-	-	-	-	-
.90	-	-						-	-	-	-	-
113.30	NS	119	19		9	4	4			-	-	-
.35		22	35	40	11					-	-	-
.40		3	84		6		5			-	-	-
.45	-	-		-	100			-	-	-	-	-
.50		6	3					-	-	-	-	-
.55	-	-	9	-				-	-	-	-	-
.60			12					-	-	-	-	-
.65	-	-	-	-	23		-	-	-	-	-	-
.70		12						-	-	-	-	-
.75	-	-	-	-			-	-	-	-	-	-
.80	-	-						-	-	-	-	-
115.27	-	-	-	-	-	-	-			-	-	-
.30	-	-	-	-	-	-	-			-	-	-
.35	-	-	-	-	-	-	-			-	-	-
.40	-	-	-	-	-	-	-			-	-	-
117.26	26	590	22	8		10		7		-	-	-
.30	6	99	153	70		51				-	-	-

Table VIII (Cont'd)
Record of the Larvae of Rockfish (Sebastodes spp.), 1956

Sta.	Cruise and Month 5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
117.35	5	138	213	88	23	19				-	-	-
.40	84	617	60	21	25	7		3		-	-	-
.45	-	-	35	-				-	-	-	-	-
.50	29	6	59	4				-	-	-	-	-
.55	-	-	41	-				-	-	-	-	-
.60				4				-	-	-	-	-
.65	-	-	-	-			-	-	-	-	-	-
.70			3					-	-	-	-	-
.75	-	-	-	-			-	-	-	-	-	-
.80	-	-						-	-	-	-	-
118.25	-	-	-	-	-	-	-			-	-	-
.30	-	-	-	-	-	-	-			-	-	-
.35	-	-	-	-	-	-	-			-	-	-
.39	39	101	24	NQ	205	27	26	-	-	-	-	-
119.33	3	35	155	35				-	-	-	-	-
120.25	29	44		22	25	22				-	-	-
.30	8	182	179	15	14	97	24	231		-	-	-
.35	-	-	-	-	-	-	-	25		-	-	-
.40	10	102	14	5				2		-	-	-
.45		158	35	324	7			17		-	-	-
.50	6			163				-	-	-	-	-
.55				4				-	-	-	-	-
.60				4	21			-	-	-	-	-
.70								-	-	-	-	-
.80	-	-						-	-	-	-	-
123.37	71	48	122	7		24	45			-	-	-
.40	68	-	39	10	-	7	-	-	-	-	-	-
.42	-		-			16		6		-	-	-
.45	-	-	113	-	-	-	-	12		-	-	-
.50	NS	8	18	5				-	-	-	-	-
.55	5	NS		-				-	-	-	-	-
.60	-	-		33				-	-	-	-	-
127.34		11	26	30	8		NS			-	-	-
.40				24	12			3		-	-	-
.45	-	-		-				7		-	-	-
.50		3		132	3	8		-	-	-	-	-
.55	12	73		-		32		-	-	-	-	-
.60	-	-						-	-	-	-	-
130.30		15	5					4		-	-	-
.35		5		14	3					-	-	-
.40								12		-	-	-
.45	-	-	NQ	-	-	-	-	4		-	-	-
.50			3	6	6	4		-	-	-	-	-

Table VIII (cont'd)
Record of the Larvae of Rockfish (Sebastodes spp.), 1956

Sta.	Cruise and Month 5601 Jan.	5602 Feb.	5603 Mar.	5604 Apr.	5605 May	5606 June	5607 July	5608 Aug.	5609 Sept.	5610 Oct.	5611 Nov.	5612 Dec.
130.60	-			3				-	-	-	-	-
133.25			17							-	-	-
.30		34	10		4		2			-	-	-
.40		8			26		25	-	-	-	-	-
.50	-	-		-				-	-	-	-	-
.60	-	-	29	-	-	-	-	-	-	-	-	-
137.23										-	-	-
.30			19		7		10	59		-	-	-
.40		14	6		10	9	10	-	-	-	-	-
.50	-	-		-				-	-	-	-	-
.60	-	-		-	-	-	-	-	-	-	-	-
140.30		6	-		-	-	-	-	-	-	-	-
.35			-	2	-	-	-	-	-	-	-	-
.40		6	-	8	-	-	-	-	-	-	-	-
.50	-		-	-	-	-	-	-	-	-	-	-
.60	-		-	-	-	-	-	-	-	-	-	-
143.26			-	3	-	-	-	-	-	-	-	-
.30		12	-	5	-	-	-	-	-	-	-	-
.35			-		-	-	-	-	-	-	-	-
.40	-		-		-	-	-	-	-	-	-	-
.50	-		-	-	-	-	-	-	-	-	-	-
.60	-		-	-	-	-	-	-	-	-	-	-
147.20			-		-	-	-	-	-	-	-	-
.25			-		-	-	-	-	-	-	-	-
.30			-		-	-	-	-	-	-	-	-
.35	-		-		-	-	-	-	-	-	-	-
.40	-		-		-	-	-	-	-	-	-	-
150.19	5		-		-	-	-	-	-	-	-	-
.25			-		-	-	-	-	-	-	-	-
.30			-		-	-	-	-	-	-	-	-
.40	-		-		-	-	-	-	-	-	-	-
153.16			-	5	-	-	-	-	-	-	-	-
.20			-		-	-	-	-	-	-	-	-
.30			-		-	-	-	-	-	-	-	-
.40	-		-		-	-	-	-	-	-	-	-
.50	-		-		-	-	-	-	-	-	-	-
.60	-		-		-	-	-	-	-	-	-	-
157.10	4	-	-	-	-	-	-	-	-	-	-	-
.20			-		-	-	-	-	-	-	-	-
.30			-		-	-	-	-	-	-	-	-
.40	-		-		-	-	-	-	-	-	-	-
.50	-		-		-	-	-	-	-	-	-	-
.60	-		-		-	-	-	-	-	-	-	-
Total	4293	7717	6403	2887	2286	1569	1489	397	0	317	358	1412

Literature Cited

AHLSTROM, ELBERT H.

1952. Pilchard eggs and larvae and other fish larvae, Pacific coast, 1950. U. S. Dept. Interior, Fish and Wildlife Service, Spec. Sci. Rept.: Fisheries No. 80, 58 pp.

1953. Pilchard eggs and larvae and other fish larvae, Pacific coast, 1951. U. S. Dept. Interior, Fish and Wildlife Service, Spec. Sci. Rept.: Fisheries No. 102, 55 pp.

1954a. Pacific sardine (pilchard) eggs and larvae and other fish larvae, Pacific coast - 1952. U. S. Dept. Interior, Fish and Wildlife Service, Spec. Sci. Rept.: Fisheries No. 123, 76 pp.

1954b. Distribution and abundance of egg and larval populations of the Pacific sardine. U. S. Dept. Interior, Fish and Wildlife Service, Fish. Bull. 93, vol. 56, pp. 83-140.

AHLSTROM, ELBERT H. and O. P. BALL

1954. Description of eggs and larvae of jack mackerel (Trachurus symmetricus) and distribution and abundance of larvae in 1950 and 1951. U. S. Dept. Interior, Fish and Wildlife Service, Fish Bull. 97, vol. 56, pp. 209-245.

AHLSTROM, ELBERT H. and R. C. COUNTS

1955. Eggs and larvae of the Pacific hake, Merluccius productus. U.S. Dept. Interior, Fish and Wildlife Service, Fish. Bull. 99, vol. 56, pp. 295-329.

AHLSTROM, ELBERT H. and D. KRAMER

1955. Pacific sardine (pilchard) eggs and larvae and other fish larvae, Pacific coast, 1953. U. S Dept. Interior, Fish and Wildlife Service, Spec. Sci. Rept.: Fisheries No. 155, 74 pp.

1956. Sardine eggs and larvae and other fish larvae, Pacific coast, 1954. U. S. Dept. Interior, Fish and Wildlife Service, Spec. Sci. Rept.: Fisheries No. 186, 79 pp.

1957. Sardine eggs and larvae and other fish larvae, Pacific Coast, 1955. U. S. Dept. Interior, Fish and Wildlife Service, Spec. Sci. Rept.: Fisheries No. 224, 90 pp.

PHILLIPS, JULIUS B.

1957. A review of the rockfishes of California (Family Scorpaenidae). State of California, Dept. Fish and Game, Fish Bull. 104, 158 pp.

INT.-DUP. SEC., WASH., D.C 30933